# INSTRUCTION MANUAL

MP MASTER
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SINGER
INSTRUMENTATION

# OSCILLOSCOPE DEVIATION MONITOR
# MODEL ODM-1
# (FOR USE WITH FM-10 MAINFRAME UNITS, SERIAL NUMBER 400 AND UP)

Manual No. 1-500783-157 (Rev. C)

5/71

The Singer Company, Los Angeles Operation

# WARRANTY

SINGER INSTRUMENTATION, LOS ANGELES OPERATION, (SELLER) warrants each new instrument to be free from defects in material and workmanship, effective after delivery to the original purchaser as follows:

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|---|---|
| TCXO Oscillator . . . . . | 2 Years |
| Sensitive Research™ Electrical Indicating Instruments . . . | 2 Years |
| Other Electrical and Electronic Measuring Instruments . . . | 1 Year |

Repair or replacement (at our option) without charge (F.O.B. factory) will be effected when our examination satisfactorily indicates that defects are due to workmanship or materials. Electron tubes, semiconductors, batteries, fuses, lamps, thermoelements, and RatioTran potentiometers are excluded from warranty coverage. Warranty returns must first be authorized by the factory.

If the instrument or any portion thereof, has been abused, misused, damaged by accident or negligence, or if any serial number or seal has been removed or altered, the warranty is void.

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Chargeable repairs: If requested, an estimate of charges will be made prior to repairs. Please provide us with the following information in order to expedite the processing of your instrument:

1. Model or Type
2. Serial Number
3. Description of trouble (1)
4. Approximate date instrument was placed in operation.
5. Approximate number of hours in use.
6. Has maintenance action been previously requested.
7. Other comments.

SELLER warrants each instrument repaired to be free from defects in material and workmanship for a period of 90 days.

(1) Include data on symptoms, measurements taken, suspected location of trouble, maintenance action taken and any other relevant data.

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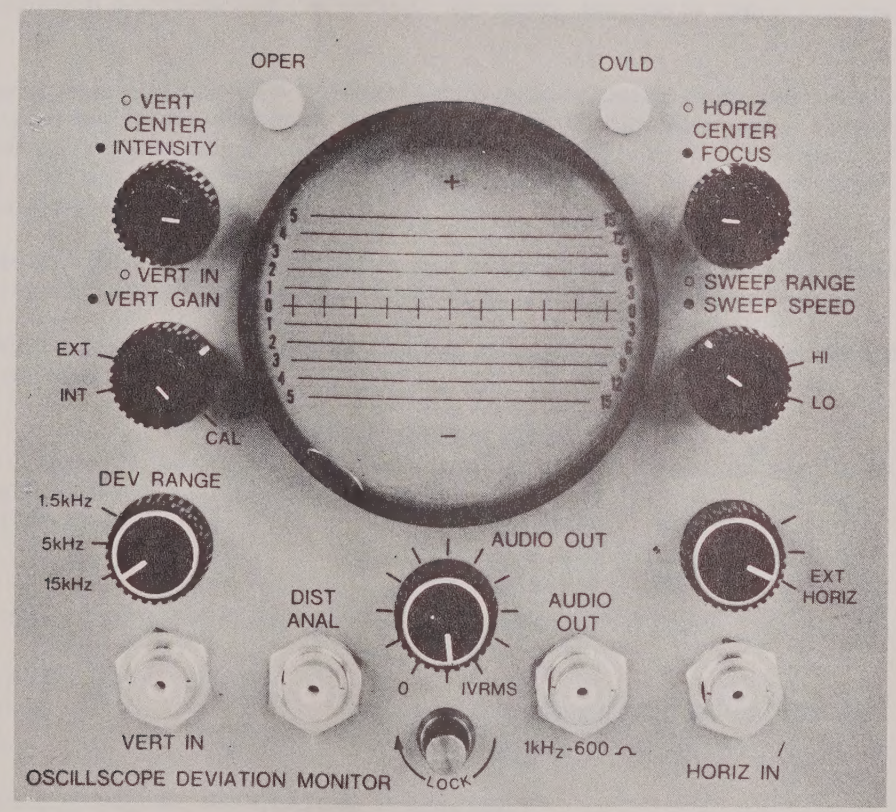
OPER
OVLD
○ VERT
CENTER
● INTENSITY
○ HORIZ
CENTER
● FOCUS
○ VERT IN
● VERT GAIN
○ SWEEP RANGE
● SWEEP SPEED
EXT
INT
CAL
HI
LO
DEV RANGE
1.5kHz
5kHz
15kHz
AUDIO OUT
DIST
ANAL
AUDIO
OUT
EXT
HORIZ
0
IVRMS
VERT IN
LOCK
1kHz-600Ω
HORIZ IN
OSCILLSCOPE DEVIATION MONITOR

Figure 1-1.

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## SECTION I

## GENERAL DESCRIPTION

The ODM-1 Plug-in module is an auxiliary unit to the Singer Gertsch FM-10 Frequency Meter/Signal Generator. The ODM-1 equips the FM-10 to generate and measure frequency modulation up to 15 KHz deviation (calibrated) and to 60 KHz (uncalibrated). The module may also be used as a general purpose oscilloscope.

In the measuring mode, demodulated FM is displayed directly on an oscilloscope screen calibrated in Kilohertz. In the FM generating modes, modulation is also displayed on the oscilloscope and is controlled by a potentiometer. An FM signal can be generated using an internally supplied tone of 1 KHz, an external tone or a combination of the two. The 1 KHz modulation tone (controllable from 0-1 vrms) is also available at a front connector for transmitter audio tests.

Other facilities provided for monitoring modulation are a loudspeaker presentation of the demodulated signal (controllable in volume) and a front panel signal output jack for connection to a distortion analyzer.

The FM-10/ODM-1 provides a complete and self-contained FM communications field test package in the range 50 KHz to 1000 MHz.

TABLE 1-1. SPECIFICATIONS

| | |
|---|---|
| DEVIATION RANGE & ACCURACY: | |
| At 1 KHz Mod. Freq. | 0 - 1.5KHz: 180Hz ± 5% of F.S.D.<br>0 - 5 KHz: 180Hz ± 5% of F.S.D.<br>0-15 KHz: 180Hz ± 5% of F.S.D. |
| At 50Hz and 3KHz Mod. Freq. | 180Hz ± 7% of F.S.D. |
| SENSITIVITY: | |
| Operate | 6 MV rms ± 3db (10MHz to 500MHz) |
| OVLD | Approx. 20 MV rms. |
| INTERNAL / COMBINED MODULATION: (Internal Only) | |
| Mod. Freq. | 1KHz ± 5% |
| Dev. Range | 0 to 60KHz (min) |
| COMBINED MOD. MODE: (Internal & External Mod. Combined) | |
| Mod. Freq. | Ext: 50Hz to 3KHz<br>Int: 1KHz ± 5% |
| Dev. Range | 0 to 60KHz (min) |
| EXTERNAL MODULATION: | |
| Mod. Freq. | 50Hz to 3KHz |
| Dev. Range | 0 to 60KHz (min) |
| Input Impedance: | Approx. 600 ohms |
| Input Level | Approx. 400 mV rms for 5KHz dev. |

TABLE 1-1. SPECIFICATIONS (CONT)

| | | |
|---|---|---|
| **DISTORTION ANALYZER OUTPUT:** | | |
| Mod. Freq. | 50Hz to 3KHz (3 db) | |
| Output Level | Approx. 280 MV p-p into 1K load at 5KHz dev. | |
| **AUDIO OUTPUT:** | | |
| Freq. | 1KHz ± 5% | |
| Voltage | 1V rms ± 3db into 600 ohms load<br>Continuously variable 0 - 1V (min) | |
| Source Impedance | 600 ohms | |
| Distortion | 1% (max) | |
| **SCOPE:** | | |
| CRT Size | 3-inch flat face. | |
| **EXTERNAL VERTICAL INPUT:** | | |
| Sensitivity | Approx. 70 MV p-p F.S.D. in 1.5KHz range. | |
| Freq. Response | 50Hz to 30KHz (3 db) | |
| **INPUT IMPEDANCE:** | Approx. 100K | |
| Attenuator | Fixed steps 1:3 1/3:10 and continuously variable 10:1 | |
| **HORIZONTAL:** | | |
| Internal | Sweep Range: | Lo = 50 to 500Hz<br>Hi = 500 to 5KHz |
| | Sweep: | Recurrent Type |
| | Sync: | Internal Automatic |
| External: | Sensitivity: | Approx. 0.6 volts p-p per inch |
| | Input Impedance: | Approx. 10 meg. |
| **OPERATING TEMPERATURE RANGE:** | -5°C to + 50°C | |
| **WEIGHT:** | Approx. 4-1/2 lbs. | |
| **POWER:** | Supplied by FM-10 | |

## SECTION II

## INSTALLATION

**PRECAUTION:** Early FM-10 units have unventilated cases and will overheat when used with the ODM-1 plug-in. A vented replacement case is supplied with the ODM-1 to owners of unvented mainframes. Ensure that the unvented case has been replaced before installing the ODM-1.

2-1. To install the ODM-1 in the FM-10 mainframe, remove the blank plate covering the plug-in aperture by turning the two screws one-quarter turn CCW.

2-2. Remove the protective cover on the connector at the rear of the aperture.

2-3. Insert ODM-1 until flush with front panel.

2-4. Turn the locking pawl clockwise until the plug-in is firmly locked.

## SECTION III

## OPERATING INSTRUCTIONS

### 3-1 INTRODUCTION

3-1-1 This section contains instructions only for operating the ODM-1 plug-in module in conjunction with the FM-10 mainframe. Refer to the operating manual for the mainframe (manual number 1-500783-015) for mainframe functions such as power supply connections, rf output control, rf signal input set-ups and beat note zeroing procedure.

### 3-2. OPERATING CONTROLS, INDICATORS AND CONNECTORS.

3-2-1 The functions of all operating controls, indicators and connectors on the ODM-1 module are described in Table 3-1.

TABLE 3-1. OPERATING CONTROLS, INDICATORS AND CONNECTORS
(Keyed to Figure 3-1)

| REF DES | PANEL MARKING | TYPE | FUNCTION |
|---|---|---|---|
| 1 | VERT CENTER (Outer Knob) | Variable Resistor | Controls vertical position of trace on CRT screen. |
| | INTENSITY (Inner Knob) | Variable Resistor | Controls brightness of CRT trace. Used with FOCUS control to obtain clear trace. |
| 2 | OPER | Indicator Light | Light is off when too little or too much IF signal is applied to the input of the ODM-1. Light is on when IF signal level is in acceptable range. |
| | | | NOTE: Oper Light is linked with OVLD indicator so that both lights are never lit at the same time. |
| 3 | OVLD | Indicator Light | Light is off at all times except when IF signal is excessive. OVLD goes off and OPER comes on when IF signal is decreased to proper level. |
| 4 | HORIZ CENTER (Outer Knob) | Variable Resistor | Controls horizontal position of trace on CRT screen. |
| 4 | FOCUS | Variable Resistor | Controls dispersion of beam on CRT screen. Used with INTENSITY control to obtain sharp trace. |
| 5 | VERT IN (Outer Knob) EXT INT | Switch, two position | INT Position: In this position, the vertical input of the oscilloscope is switched to the output of the internal demodulator. |

TABLE 3-1. OPERATING CONTROLS, INDICATOR AND CONNECTORS (CONT)
(Keyed to Figure 3-1)

| REF DES | PANEL MARKING | TYPE | FUNCTION |
|---|---|---|---|
| 5 | VERT IN<br>(Outer Knob)<br>EXT<br>INT<br>(cont) | Switch, two position | EXT Position: In this position, the vertical input of the oscilloscope is switched to the VERT IN connector. |
| | VERT GAIN<br>(Inner Knob)<br>CAL | Variable Resistor | Varies vertical gain. CAL Position Fully CW: In this position, vertical gain is calibrated to one of three ranges (1.5, 5 and 15KHz) selected by the DEV RANGE control. |
| 6 | SWEEP RANGE<br>HI – LO<br>(Outer Knob) | Switch, two position | Provides coarse control of sweep speed. Is switched out of circuit when an external horizontal input signal is used and MOD MODE is at EXT HORIZ. |
| | SWEEP SPEED<br>(Inner Knob) | Resistor, variable | Provides fine control of sweep speed. |
| 7 | DEV RANGE<br>1.5KHz, 5KHz,<br>15KHz | Switch, three position | Selects calibrated vertical input ranges. When VERT GAIN control is in the CAL position, calibration for 5KHz range is at left of CRT screen and calibration for 1',5 and 15KHz ranges is at right. |
| 8 | MOD MODE<br>INT / COMB<br>EXT<br>EXT HORIZ | Switch, three position | INT/COMB Position: In this position, the internal 1KHz modulation tone (controlled by INT MOD/AUDIO OUT control) and the EXT MOD / HORIZ IN connectors are switched into the modulation circuit.<br>An external modulation tone supplied to the EXT MOD / HORIZ IN connector is combined with the internal 1KHz tone. |
| | | | EXT Position: In this position, the internal 1KHz is removed from the modulation circuit and only the EXT MOD / HORIZ IN connector is in circuit. |
| | | | EXT HORIZ: In this position, EXT MOD / HORIZ IN connector is switched into the horizontal drive circuit for external horizontal drive. |
| 9 | VERT IN | Connector, BNC | Vertical input jack. |
| 10 | DIST ANAL | Connector, BNC | Demodulated audio available at this jack for output to a distortion analyzer. |

TABLE 3-1. OPERATING CONTROLS, INDICATORS AND CONNECTORS (CONT)
(Keyed to Figure 3-1)

| REF DES | PANEL MARKING | TYPE | FUNCTION |
|---|---|---|---|
| 11 | INT MOD / AUDIO OUT PWR OFF | Variable Resistor, Switched | Controls internal modulation level when MOD MODE switch is at INT / COMB. Also controls level of 1KHz tone (available at AUDIO OUT connector) from 0 to 1 VRMS. Also controls power to ODM-1 module. |
| 12 | AUDIO OUT | Connector, BNC | 1KHz signal output available at this jack. Level controlled from 0 to 1 VRMS by INT MOD / AUDIO OUT control. |
| 13 | EXT MOD / HORIZ IN | Connector, BNC | This jack is used: (1) to provide an external modulation tone to the modulation circuit when the MOD MODE switch is at INT / COMB or EXT, (2) to provide an external horizontal drive when the MOD MODE switch is at EXT HORIZ. |

## 3-3. PRELIMINARY OSCILLOSCOPE SET-UP PROCEDURE

3-3-1. Switch on power to FM-10 mainframe.

3-3-2. Turn on power to ODM-1 module by turning internal modulation control INT MOD/AUDIO OUT clockwise. Allow approximately 1 minute for warm-up.

3-3-3. Position other controls:

| | | | | |
|---|---|---|---|---|
| MOD MODE | INT | | VERT CENTER | To mid-range |
| INTENSITY | Fully CW | | HORIZ CENTER | To mid-range |

The trace should now be visible on the screen.

3-3-4. Adjust FOCUS & INTENSITY for sharpest trace.

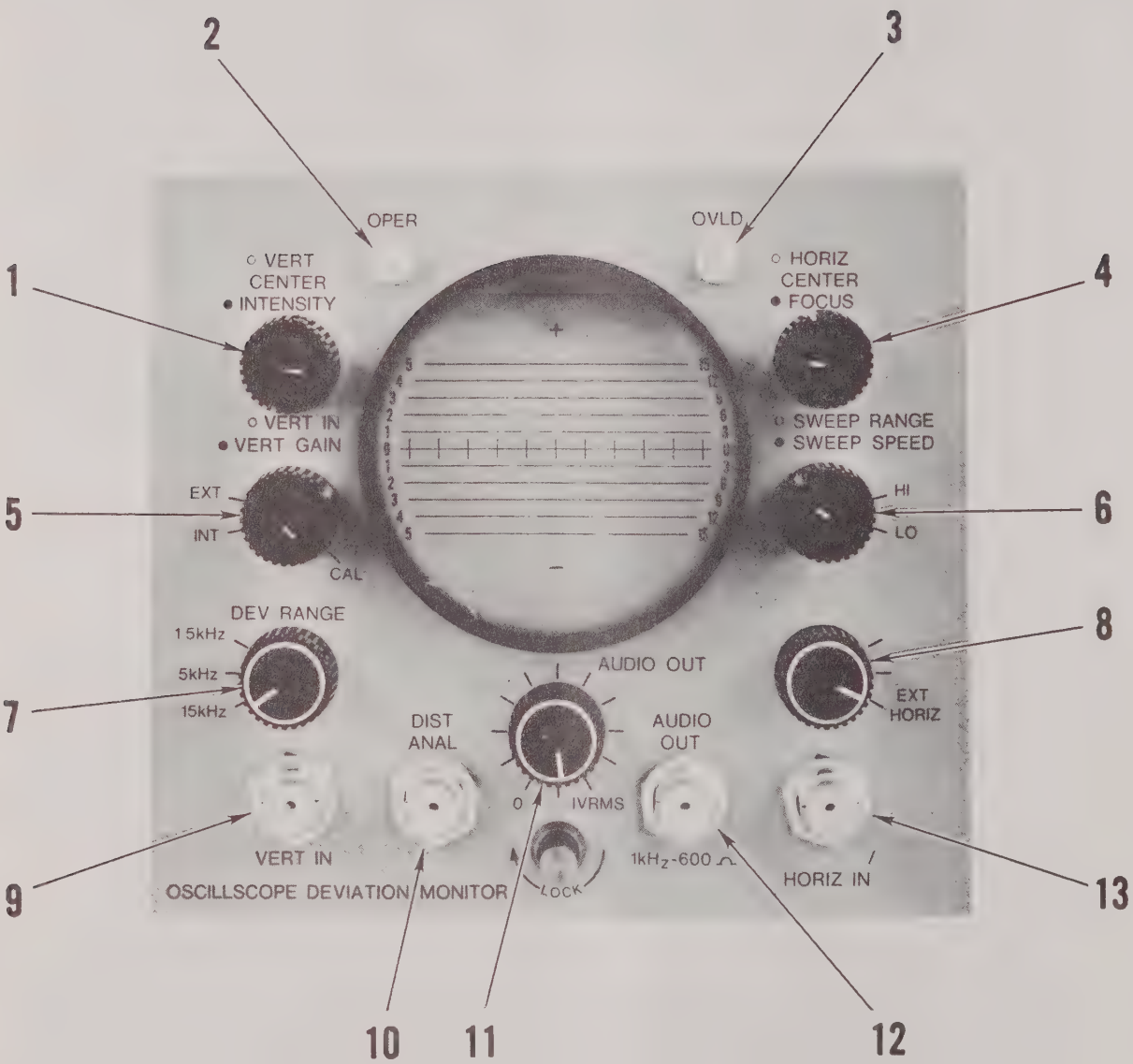



Figure 3-1. Operating Controls, Indicators and Connectors

## 3-4. FM DEVIATION MEASUREMENT

3-4-1. Dial frequency decade controls to frequency of transmitter. Example: Transmitter frequency -- 276.0359MHz.

3-4-2. Offset FM-10 frequency by ± 2 MHz. (See Figure 3-2.)

Figure 3-2. Frequency Controls Setup

3-4-3. Couple transmitter FM output to FM-10 MEAS INPUT connector via antenna provided OR use cable input, with an RFA-60 attenuator in the line.

3-4-4. Position other controls as follows:

| | | | |
|---|---|---|---|
| VERT IN | INT | 10MHz (in-out switch) | OUT |
| VERT GAIN | CAL (fully CW) | DEV RANGE | AS REQUIRED |
| AUDIO | OUT / MOD | | |

3-4-5. Key transmitter (do not modulate).

3-4-6. Increase RF input until operating indicator OPER lights.

3-4-7. If overload indicator OVLD lights, decrease RF input until OPER lights and OVLD goes out.

3-4-8. Adjust VERT centering to align trace in center of CRT screen.

3-4-9. Modulate transmitter by voice or tone.
(Note: 1 KHz tone variable from 0-1 vrms is available at AUDIO OUT. Refer to Section 3-10 for set up).

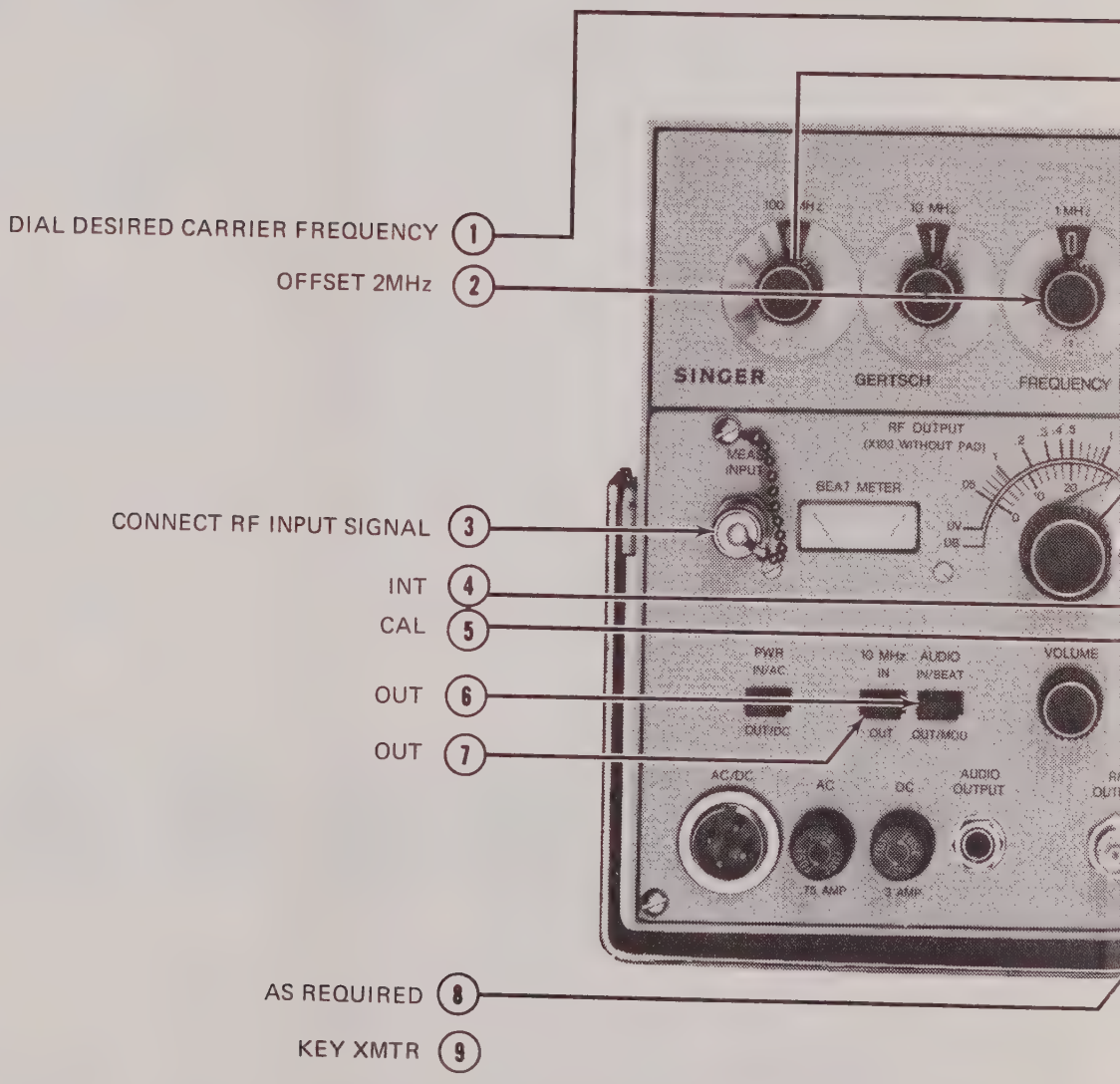
3-4-10. Adjust sweep range and sweep speed for the number of cycles to be displayed.

3-4-11. Use appropriate KHz scale on screen to measure peak height of wave. Check waveform visually for presence of distortion.

3-4-12. Monitor the modulation aurally by adjusting VOLUME control to desired listening level.

3-4-13. To investigate audio distortion further, connect a distortion analyzer to DIST ANAL output.

NOTE: FOLLOW THE STEPS IN THE SEQUENCE SHOWN.



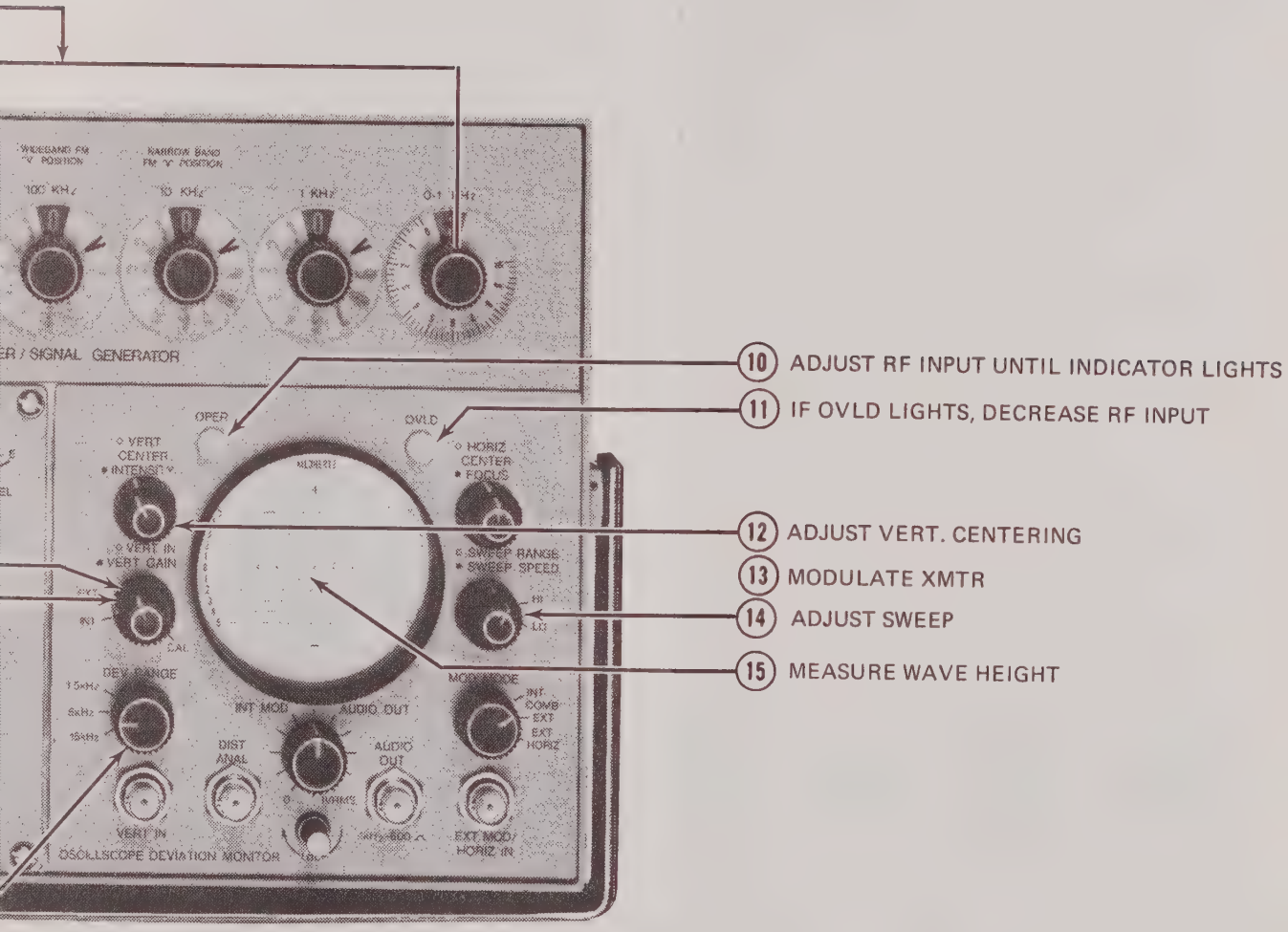



Figure 3-3. FM Deviation Measurement – Quick Set-up

3-5-9. Key transmitter (do not modulate) and increase RF input until operating indicator OPER lights. If overload indicator OVLD lights, decrease RF input until OPER lights and OVLD goes out.

3-5-10. Adjust vert centering to align trace in center of screen.

3-5-11. Turn INT MOD/AUDIO OUT control CW until wave height reaches the desired deviation.

3-5-12. Disconnect signal source from MEAS INPUT.

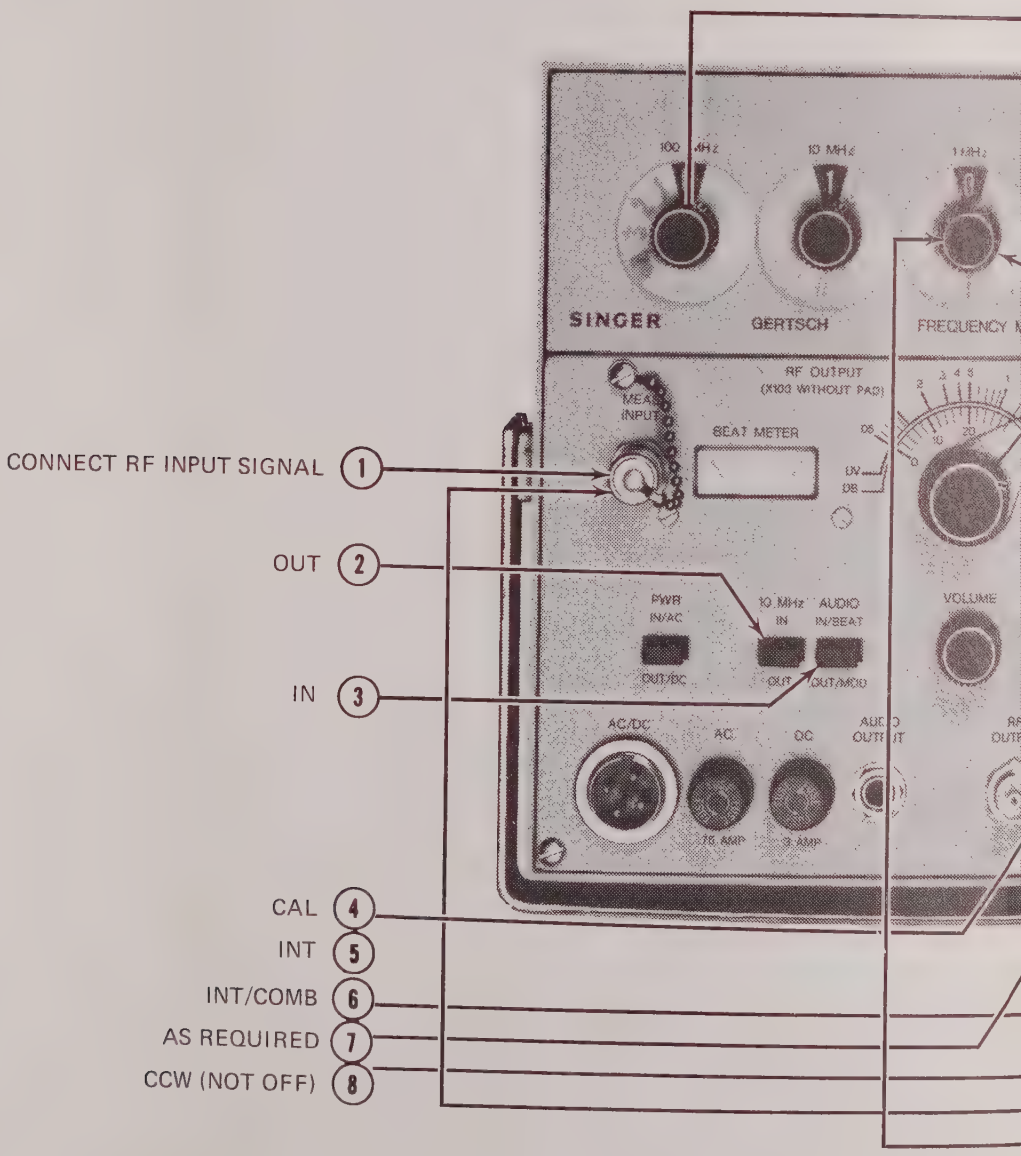
3-5-13. Return FM-10 frequency controls to carrier frequency by removing ± 2 MHz offset.

3-5-14. The FM-10/ODM-1 is now generating an FM output of the desired deviation at 97.3527 MHz.

3-5-15. WIDEBAND (> 6KHz).

3-5-16. The procedure for wideband deviation is the same as for narrowband except set 100 KHz control to V at para 3-5-6, instead of 10 KHz control.

NOTE: FOLLOW THE STEPS IN THE SEQUENCE SHOWN.



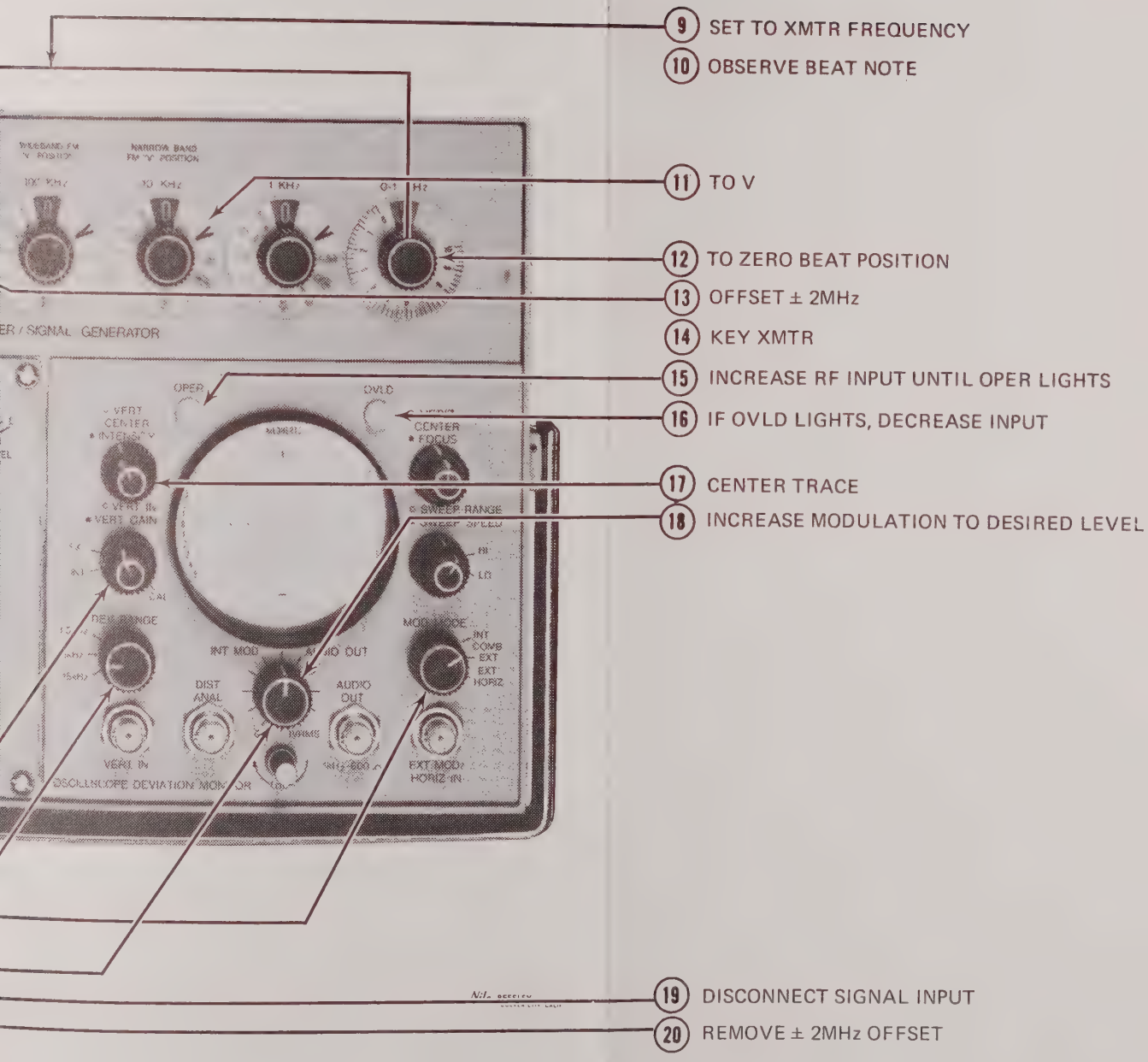
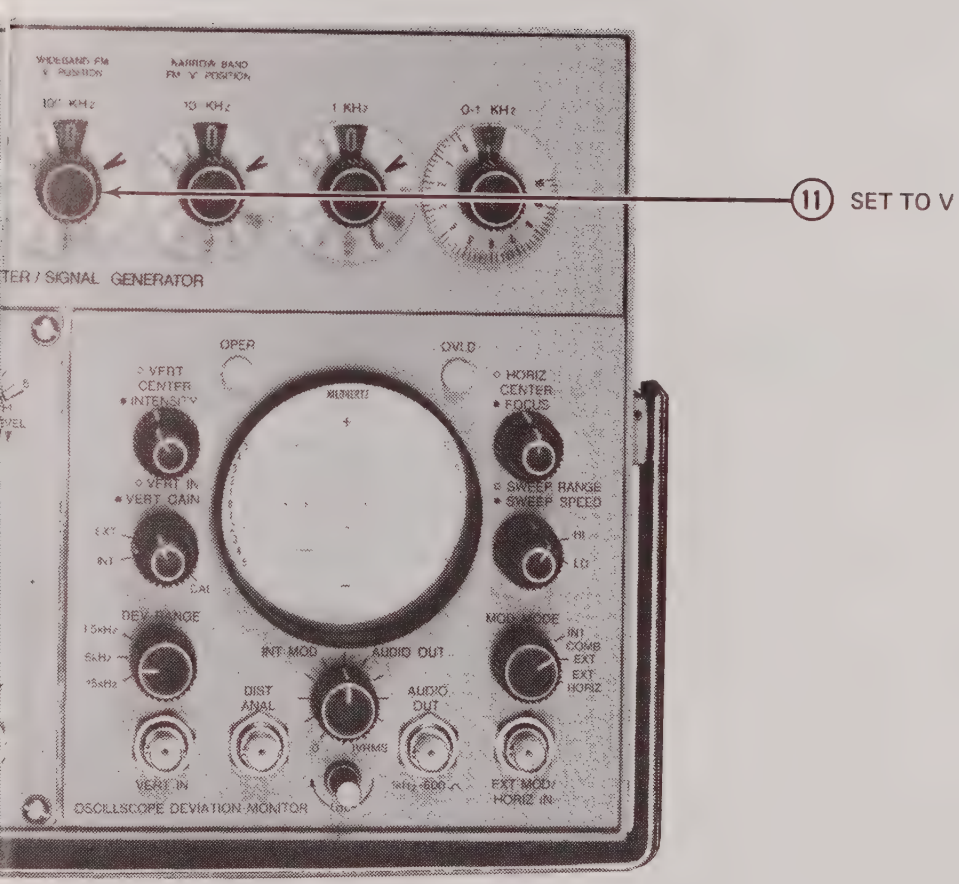



Figure 3-6. Narrowband Internal Modulation WITH External RF Source – Quick Set-up

NOTE: FOLLOW THE STEPS IN THE SEQUENCE SHOWN

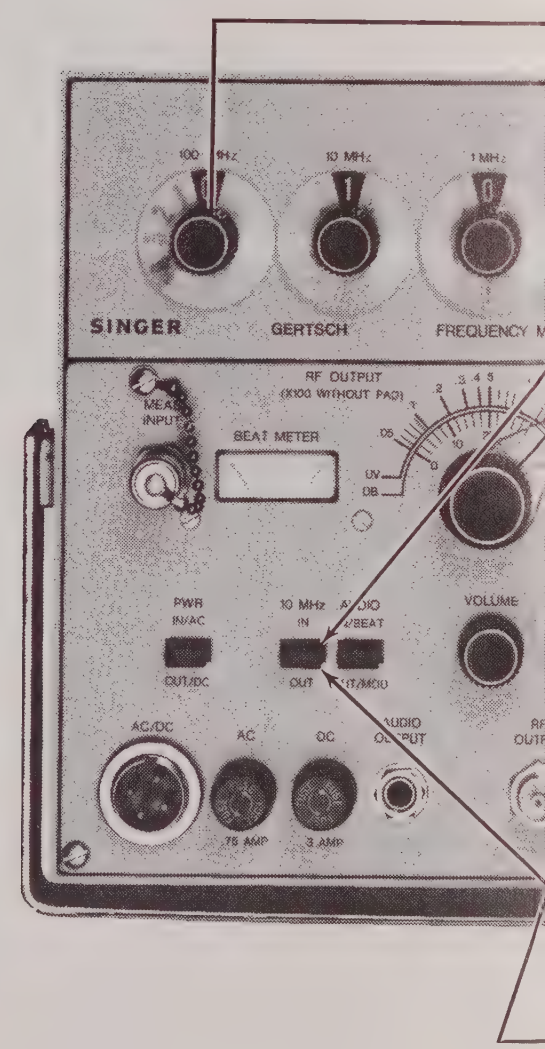
REPEAT NARROWBA
SET 100KHz C




) SET-UP (FIGURE 3-3) EXCEPT
NTROL TO V AT STEP 11.

Figure 3-7. Wideband Internal Modulation WITH External RF Source – Quick Set-up

NOTE: FOLLOW THE STEPS IN THE SEQUENCE SHOWN.



3-6-9. WIDEBAND > 6kHz.
Example: Modulate 273.9398MHz to 15kHz.

3-6-10. Position controls as follows:

| | | | |
|---|---|---|---|
| Frequency controls | 012.V000 | VERT GAIN | CAL |
| 10MHz (in-out switch) | IN | MOD MODE | INT/COMB |
| DEV RANGE | 15kHz | INT MOD/ AUDIO OUT | CCW |
| VERT IN | INT | | |

3-6-11. Turn INT MOD/AUDIO OUT control until wave height reaches 15kHz.

3-6-12. Push 10MHz (in-out) switch to OUT.

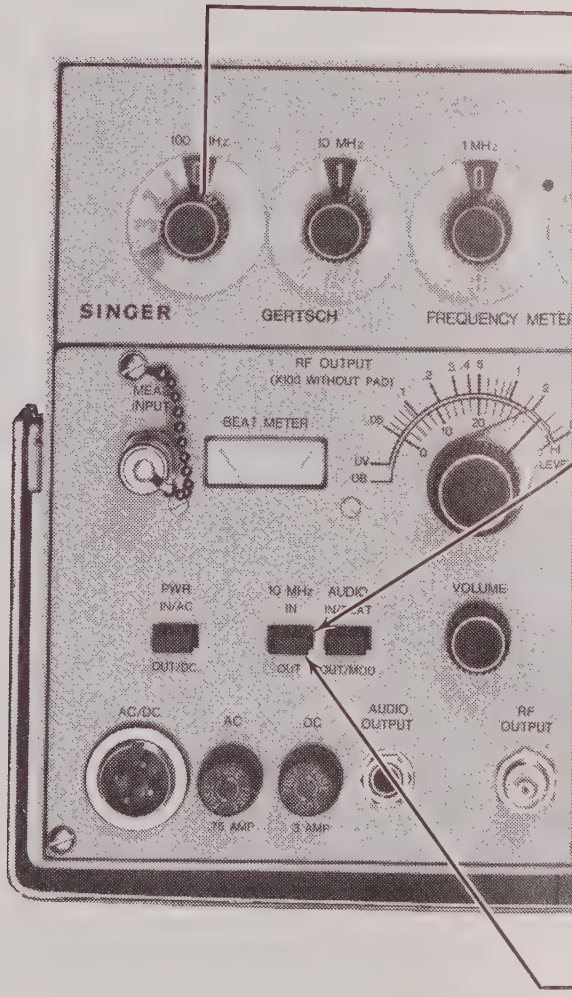
3-6-13. Re-set FM-10 frequency controls to carrier frequency.

3-6-14. Turn 0-1kHz control to value of 100 kHz and 10kHz controls.

3-6-15. Turn 100kHz control to V.

3-6-16. The FM-10/ODM-1 is now generating 15kHz deviation at 273.9398MHz.

NOTE: FOLLOW THE STEPS IN THE SEQUENCE SHOWN.



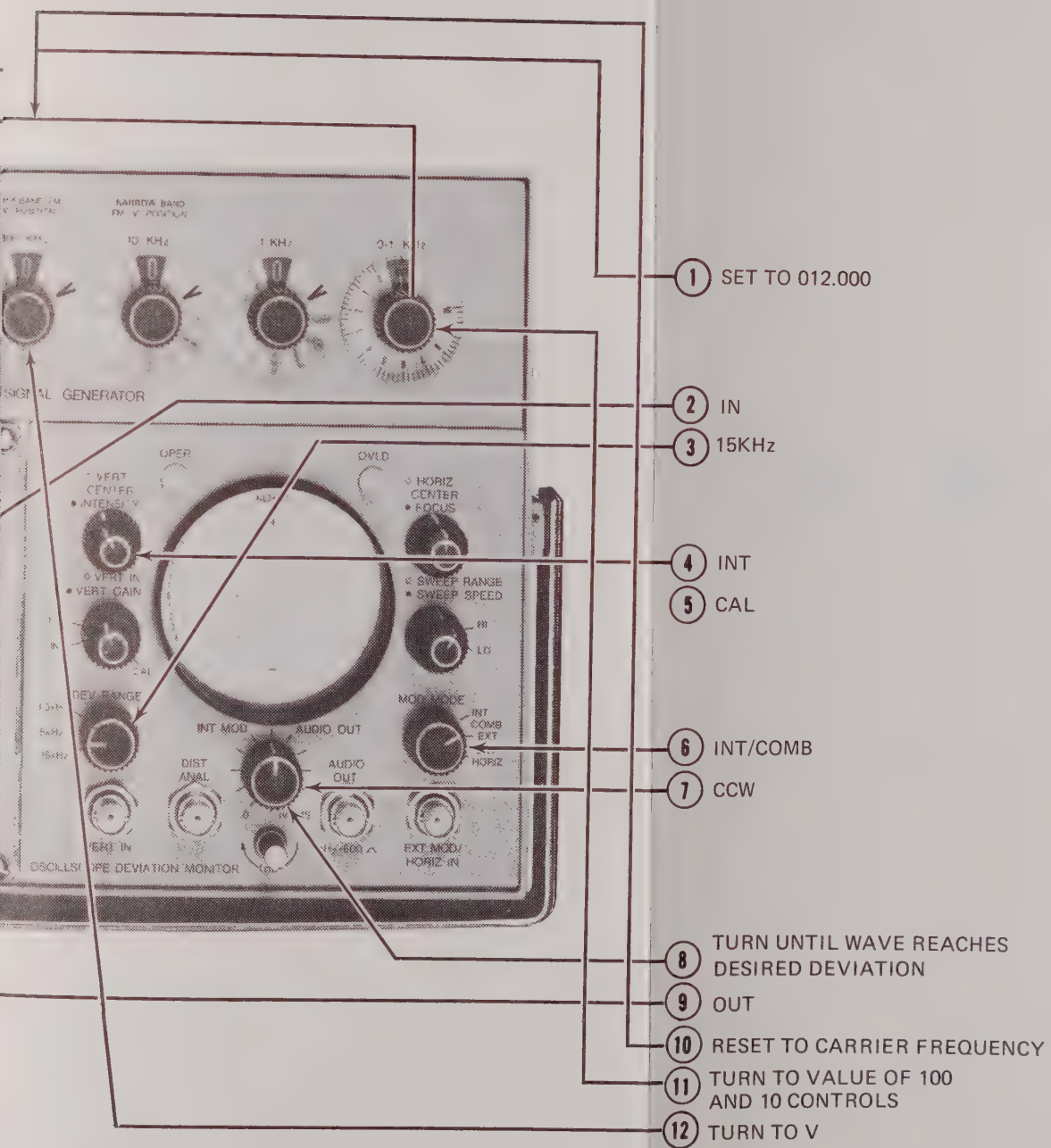



Figure 3-10. Wideband Internal Modulation WITHOUT External RF Source – Quick Set-up

3-7. FM MODULATION TO 60kHz DEVIATION.

Note: The FM-10/ODM-1 provides deviation measurement to 15 kHz. However, deviation as high as 60 kHz can be obtained by the following procedure.

Example: Modulate 36.2471MHz to 50kHz deviation.

3-7-1. Position controls:

| | | | |
|---|---|---|---|
| Frequency Controls | 012.0V00 | VERT IN | INT |
| 10MHz | IN | VERT GAIN | CAL |
| AUDIO | OUT/MOD | DEV RANGE | 5 kHz |
| INT MOD/ AUDIO OUT | CCW (not off) | MOD MODE | INT/COMB |

3-7-2. Turn INT MOD/AUDIO OUT control until wave height reaches one tenth the desired deviation (5 kHz).

3-7-3. Push 10 kHz switch to OUT.

3-7-4. Re-set frequency controls to carrier frequency.

3-7-5. Turn 0-1 kHz control to same value as the 100 and 10 kHz controls.

3-7-6. Turn 100 kHz control to V. (See figure 3-11.)

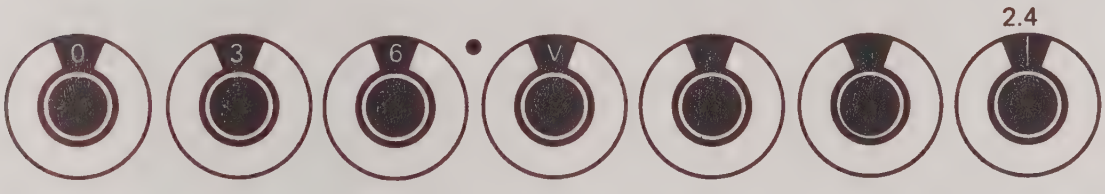
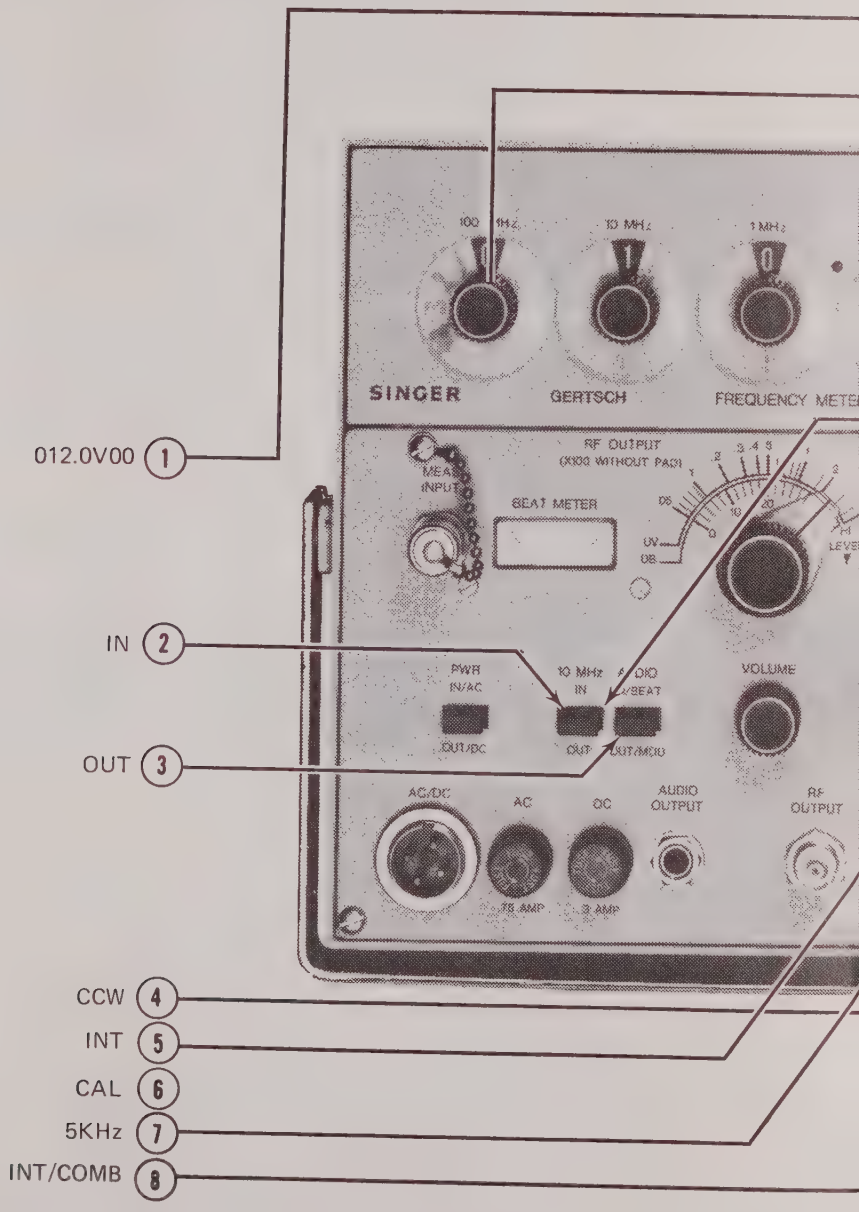



Figure 3-11. Frequency Control Setup

3-7-7. The FM-10/ODM-1 is now generating 50 kHz deviation at 36.247 MHz.

Note: In the example, the deviation of 3.78 kHz is set up with the 10 kHz control in the V position. This is multiplied by 10 when the 100 kHz control is set to V instead, in paragraph 3-7-6. The deviation thus becomes 37.8 kHz. This corresponds to 50 kHz when the 0-1 kHz control is set to 2.47.

NOTE: FOLLOW THE STEPS IN THE SEQUENCE SHOWN.



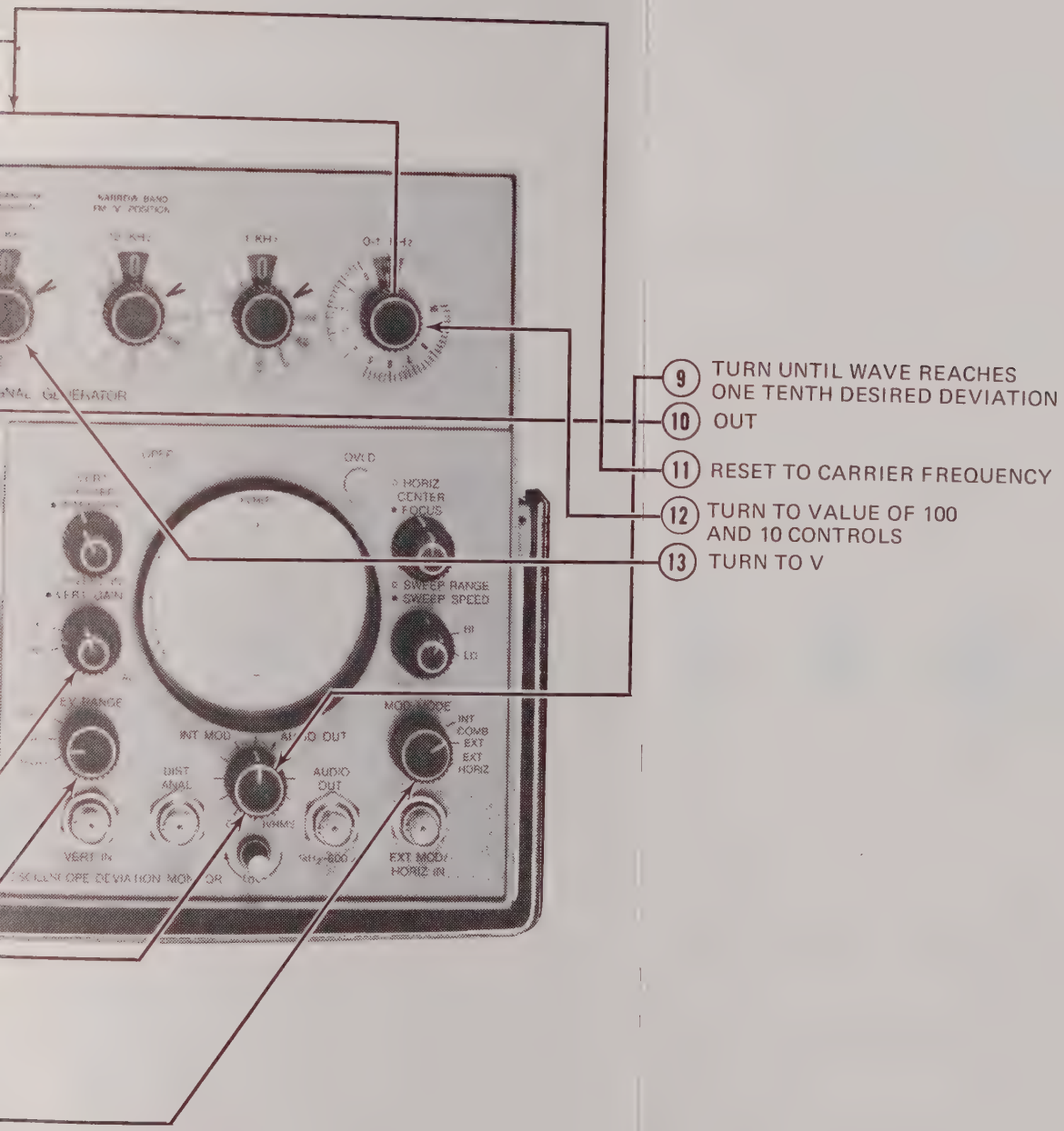



Figure 3-12. 60KHz Deviation – Quick Set-up

3-8. COMBINED INTERNAL/EXTERNAL (TWO-TONE) MODULATION.
Note: An external RF generator or transmitter must be used.

3-8-1. Set external audio oscillator to desired frequency and set to zero output.

3-8-2. Connect oscillator to EXT MOD/HORIZ IN.

3-8-3. Connect RF input to MEAS INPUT. Use direct or antenna input with attenuation to ensure zero or minimum initial input.

3-8-4. Position other controls as follows:

| | | | |
|---|---|---|---|
| 10MHz (in-out switch) | OUT | MOD MODE | INT / COMB |
| AUDIO | IN / BEAT | DEV RANGE | AS REQUIRED |
| VERT GAIN | CAL | INT MOD / AUDIO OUT | CCW (not off) |
| VERT IN | INT | | |

3-8-5. Set FM-10 frequency controls to desired carrier frequency. Example: 97.3527MHz.

3-8-6. Observe audible beat note output.

3-8-7. Turn 10 KHz or 100 KHz control to V position, according to whether narrowband or wideband modulation is required.

3-8-8. Turn 0-1 KHz control until zero beat note condition is obtained.

3-8-9. Offset by ± 2 MHz. (See figure 3-13.)

Figure 3-13. Frequency Controls Setup

3-8-10. Key transmitter (do not modulate) or increase output of RF generator, until operating indicator OPER lights.

3-8-11. If overload indicator OVLD lights, decrease RF input until OPER lights and OVLD goes out.

3-8-12. Adjust VERT CENTER to align trace on screen.

3-8-13. Turn INT MOD/AUDIO OUT control CW until wave height reaches desired deviation.

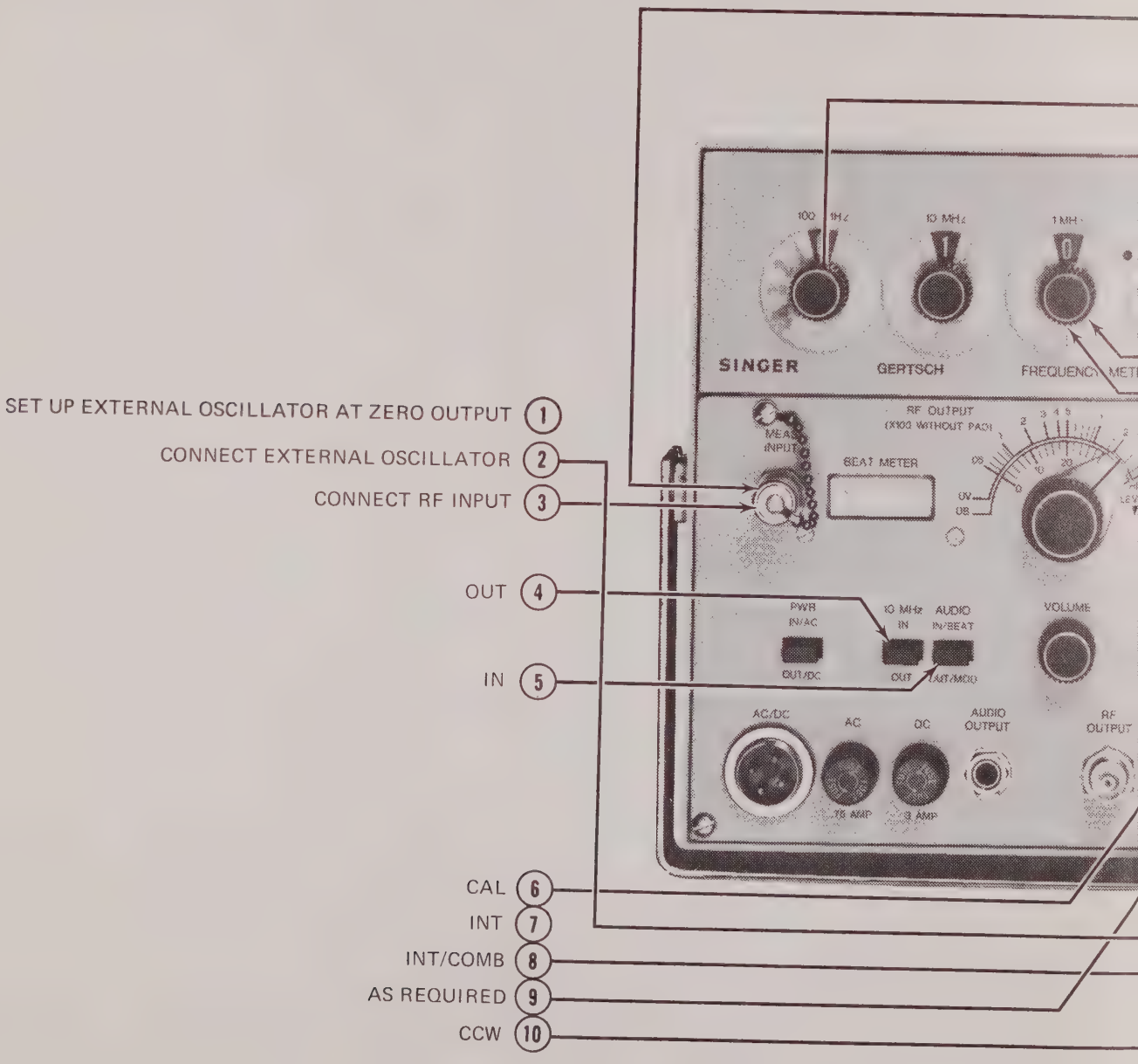
3-8-14. Increase output of external oscillator until wave height on CRT reaches total deviation required (internal 1 KHz and external combined).

3-8-15. Disconnect RF signal source from MEAS INPUT.

3-8-16. Re-set FM-10 to transmitter frequency by removing ± 2 MHz offset.

3-8-17. The FM-10/ODM-1 is now supplying two-tone FM modulation at the desired carrier frequency.

NOTE: FOLLOW THE STEPS IN THE SEQUENCE SHOWN.



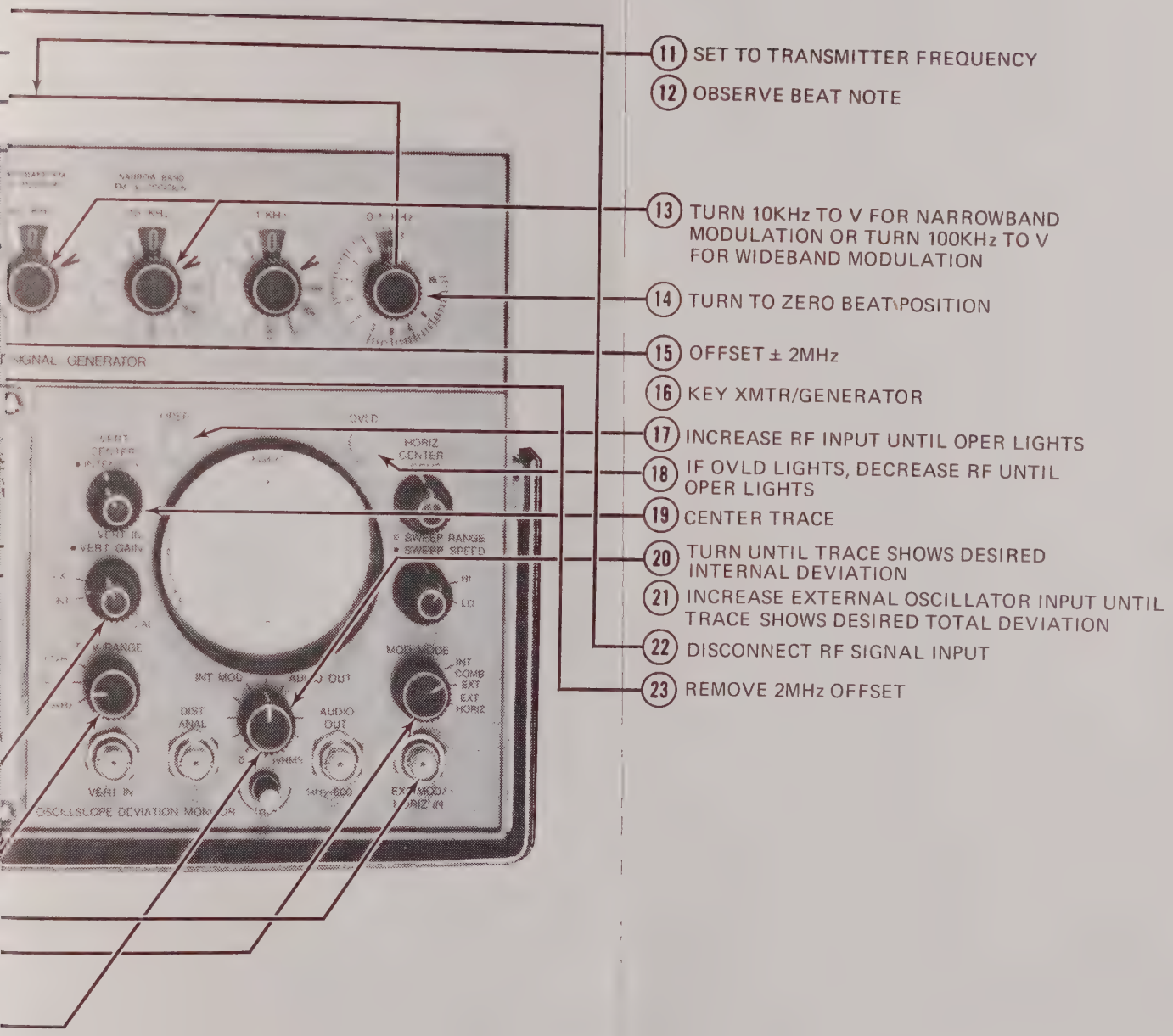

11 SET TO TRANSMITTER FREQUENCY
12 OBSERVE BEAT NOTE
13 TURN 10KHz TO V FOR NARROWBAND MODULATION OR TURN 100KHz TO V FOR WIDEBAND MODULATION
14 TURN TO ZERO BEAT POSITION
15 OFFSET ± 2MHz
16 KEY XMTR/GENERATOR
17 INCREASE RF INPUT UNTIL OPER LIGHTS
18 IF OVLD LIGHTS, DECREASE RF UNTIL OPER LIGHTS
19 CENTER TRACE
20 TURN UNTIL TRACE SHOWS DESIRED INTERNAL DEVIATION
21 INCREASE EXTERNAL OSCILLATOR INPUT UNTIL TRACE SHOWS DESIRED TOTAL DEVIATION
22 DISCONNECT RF SIGNAL INPUT
23 REMOVE 2MHz OFFSET
OVLD
HORIZ CENTER
VERT GAIN
SWEEP RANGE
SWEEP SPEED
INT MOD
AUDIO OUT
INT
COMB
EXT
EXT HORIZ
DIST ANAL
AUDIO OUT
VERT IN
EXT MOD/ HORIZ IN

Figure 3-14. Two-Tone Modulation – Quick Set-up

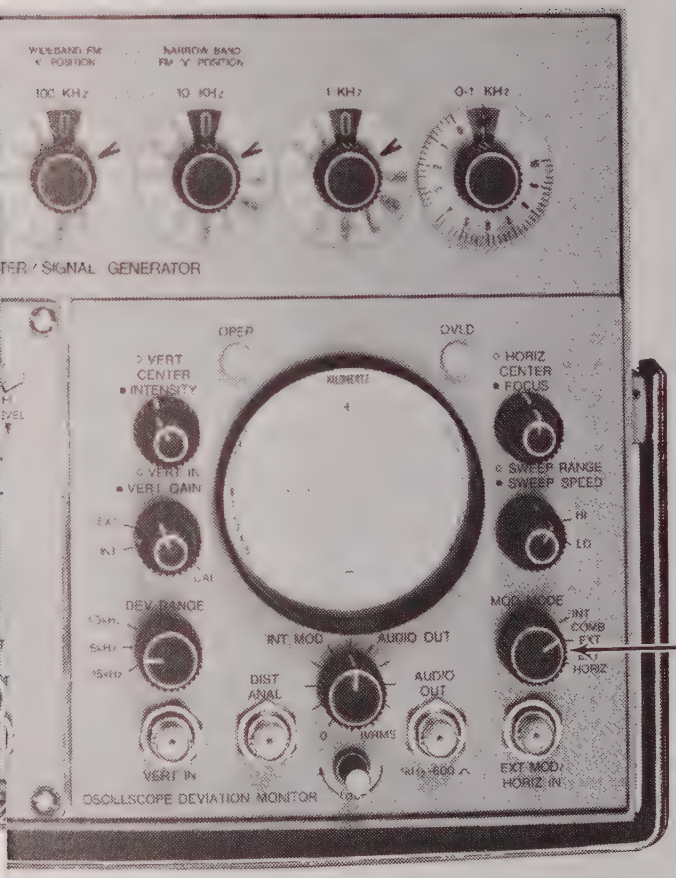
3-9. EXTERNAL MODULATION ONLY. Repeat 3-8 with MOD MODE switch at EXT and omit internal modulation (step 3-8-13).

Note: Internal 1 KHz modulation oscillator is out of circuit when MOD MODE is at EXT.

NOTE: FOLLOW THE STEPS IN THE SEQUE

SET UP AS FOR TWO-T
EXCEPT SET MOD MO

ICE SHOWN.




8 SET TO EXT

ONE MODULATION (FIGURE 3-14)
DE SWITCH TO EXT AT STEP 8.

Figure 3-15. External Modulation Only -- Quick Set-up

3-10. AUDIO TEST TONE GENERATION

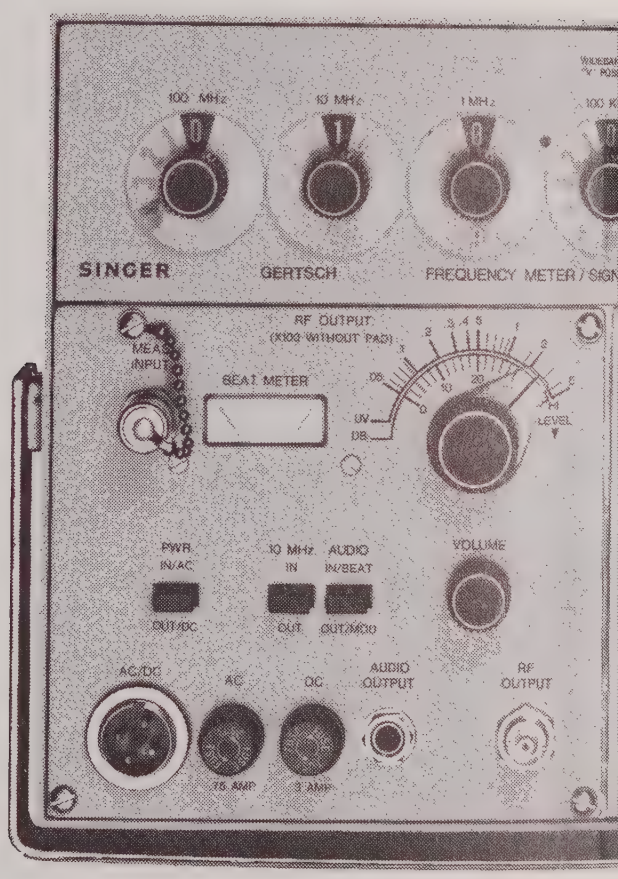
Note: The 1 KHz modulation tone developed by the FM-10/ODM-1 is available at all times at the AUDIO OUT connector for testing of transmitters and repeaters.

3-10-1. Connect transmitter microphone input to AUDIO OUT.

3-10-2. Turn INT MOD/AUDIO OUT control to level desired (a maximum of 1 vrms into 600 ohms is available).

3-10-3. The FM-10/ODM-1 is now supplying a 1 KHz tone with 600 ohms output impedance.

NOTE: FOLLOW THE STEPS IN THE SEQUENCE SHOWN.



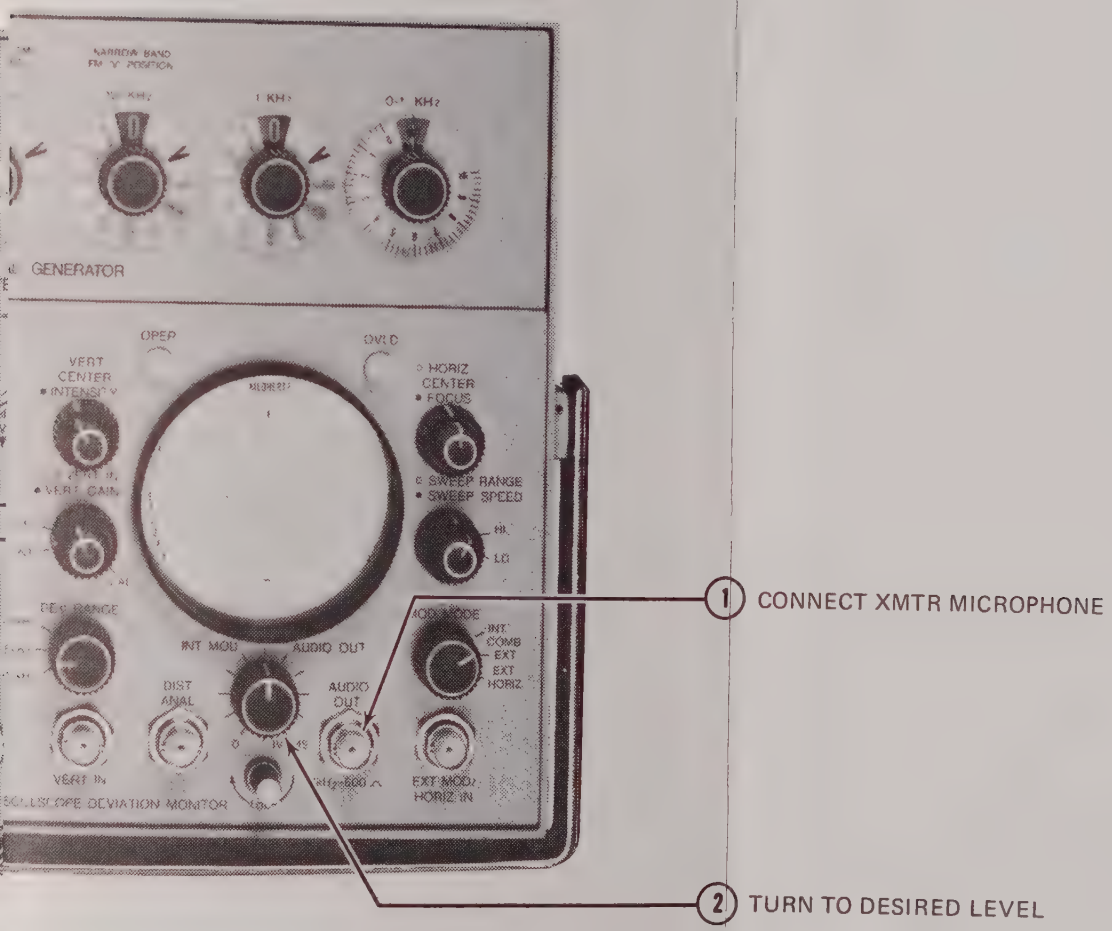



Figure 3-16. Audio Test Tone Generation – Quick Set-up

3-11. USE AS A GENERAL PURPOSE OSCILLOSCOPE.

3-11-1. INTERNAL HORIZONTAL SWEEP.

3-11-2. Turn VERT IN control to EXT.

3-11-3. For maximum sensitivity turn VERT GAIN control fully CW with DEV RANGE switch in the 1.5 KHz position.

3-11-4. Connect signal to be displayed on CRT to VERT IN. (Signal must be within 50 Hz to 30 KHz range.)

3-11-5. Turn MOD MODE switch to INT/COMB or EXT.

3-11-6. Adjust VERT GAIN control and DEV RANGE switch for suitable trace height.

3-11-7. Turn SWEEP RANGE switch to HI or LO for coarse adjustment of horizontal display.

3-11-8. Adjust SWEEP SPEED control for number of cycles to be displayed.

3-11-9. EXTERNAL HORIZONTAL SWEEP.

3-11-10. Repeat 3-11-1 through 3-11-8, except turn MOD MODE to EXT HORIZ.

3-11-11. Connect EXT MOD/HORIZ IN to external sweep signal source.

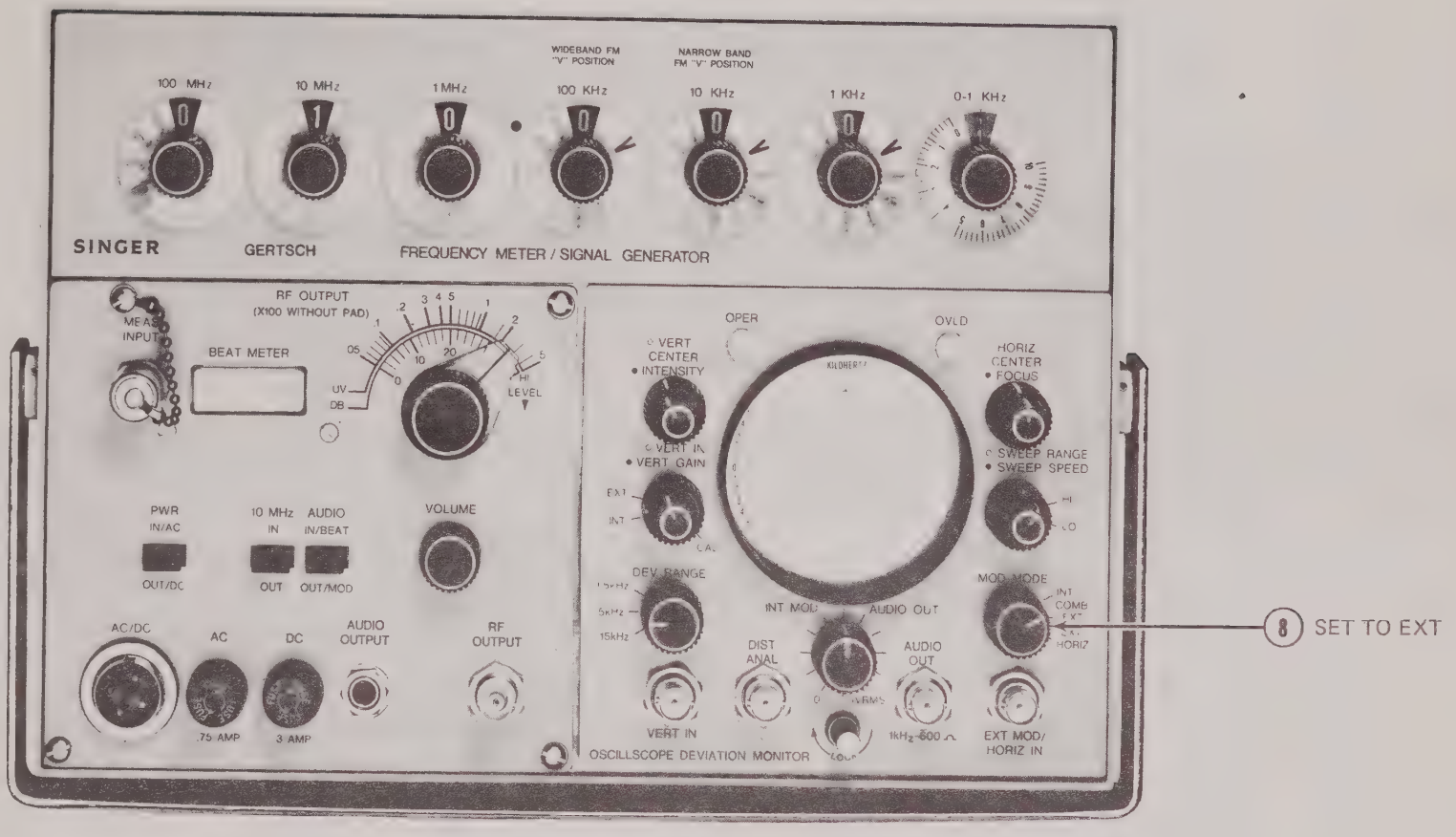



Figure 3-19. External Modulation Only — Quick Set-up

SET UP AS FOR TWO-TONE MODULATION (FIGURE 3-18)
EXCEPT SET MOD MODE SWITCH TO EXT AT STEP 8.

3-10 AUDIO TEST TONE GENERATION

Note The 1 KHz modulation tone developed by the FM-10/ODM-1 is available at all times at the AUDIO OUT connector for testing of transmitters and repeaters.

3-10-1 Connect transmitter microphone input to AUDIO OUT.

3-10-2 Turn INT MOD/AUDIO OUT control to level desired (a maximum of 1 vrms into 600 ohms is available).

3-10-3. The FM-10/ODM-1 is now supplying a 1 KHz tone with 600 ohms output impedance.

## SECTION IV

## THEORY OF OPERATION

4-1. GENERAL (see Figure 4-1)

4-1-1. The ODM-1 plug-in module derives its power supplies and signal input via the rear connector. It carries its own power switch to permit use of the mainframe while the plug-in is switched off. High voltage power supplies for the CRT are also developed within the module. The module utilizes the 2MHz IF output signal developed within the mainframe. There are four sub-assemblies in the ODM-1: IF board, vertical amplifier board, horizontal amplifier board and high voltage power supply board.

4-1-2. IF BOARD

The 2MHz IF frequency generated in the FM-10 is amplified by the 2MHz IF amplifier and supplied to the integrated circuit limiter/discriminator and level detector amplifier. The level detector amplifier output is rectified and applied to the operate and overload Schmitt triggers. These drive the operate and overload lights which provide indication of the IF signal level. The demodulated signal from the limiter/discriminator is supplied to the deviation range switch and the distortion analyzer output on the front panel. The auxiliary audio amplifier supplies the recovered audio to the FM-10 audio system for monitoring. The 1KHz oscillator is a Wien-bridge type which provides for internal modulation of the FM-10. The 1KHz oscillator output is amplified by the 1KHz driver amplifier and supplied to the front panel for external use.

4-1-3. VERTICAL AMPLIFIER BOARD

The demodulated audio signal is supplied to the vertical amplifier board via the deviation range switch. The vertical amplifier is a high gain DC-coupled amplifier with differential outputs driving the CRT vertical deflection plates. A separate amplifier supplies the vertical signal to the horizontal sweep to provide internal sync. An external vertical input mode is provided for general oscilloscope use.

4-1-4. HORIZONTAL AMPLIFIER BOARD

The horizontal amplifier board consists of a sweep generator (sawtooth) and an amplifier. The frequency of the sawtooth generator is determined by the sweep range and sweep speed front panel control settings. A trigger signal is applied to the sweep generator to allow triggering from the vertical input signal. The horizontal deflection amplifier is a DC-coupled amplifier with differential outputs driving the CRT horizontal deflection plates. An external horizontal input mode is provided to drive the horizontal amplifier from an external source. This same input may also provide modulation of the FM-10 from an external source by appropriate switching.

4-1-5. HIGH VOLTAGE POWER SUPPLY BOARD

The high voltage power supply in a DC-DC converter which generates the 800V and 300V required for the CRT. An additional negative supply of -15V is provided for the vertical and horizontal deflection amplifiers.

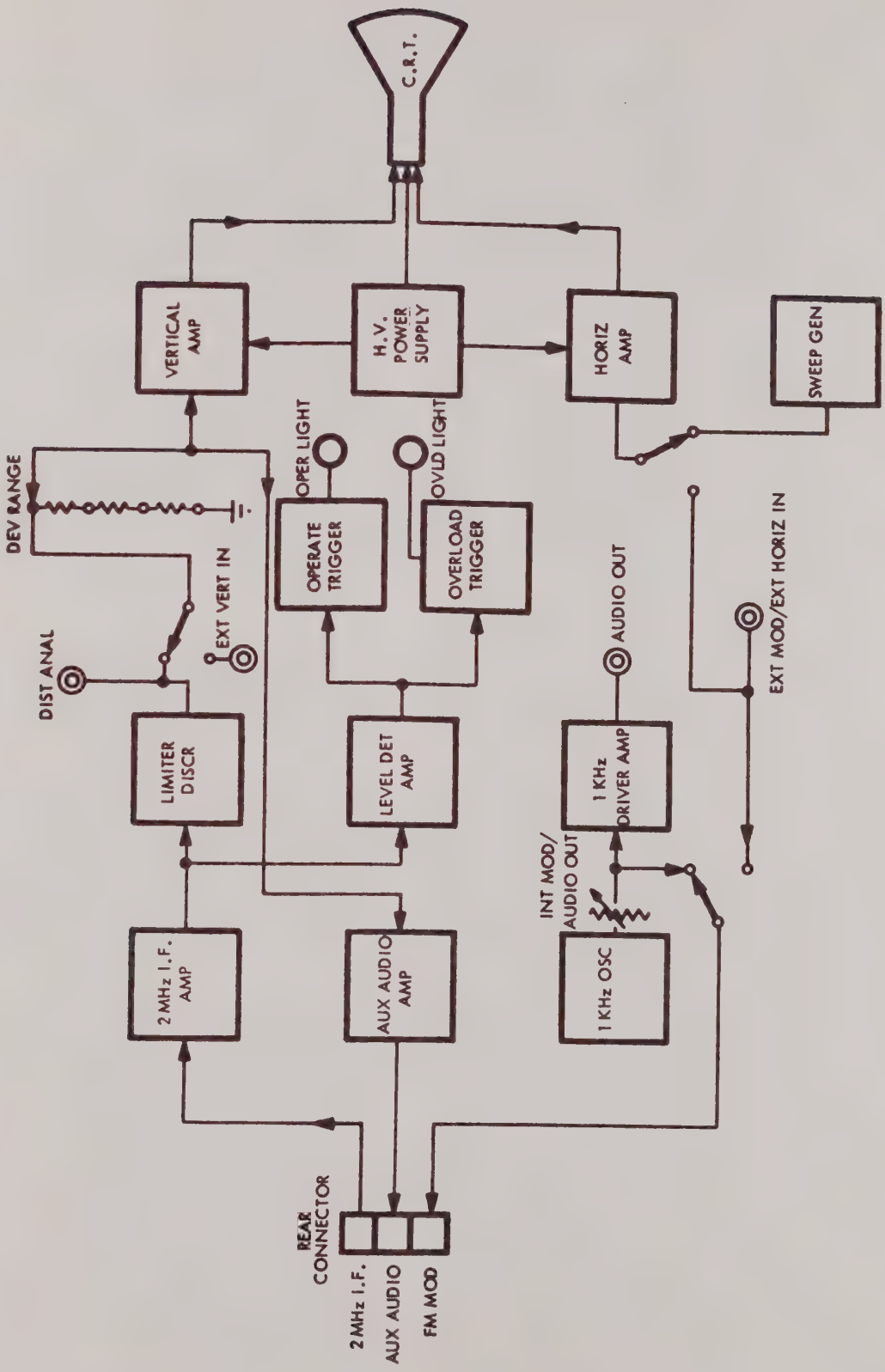
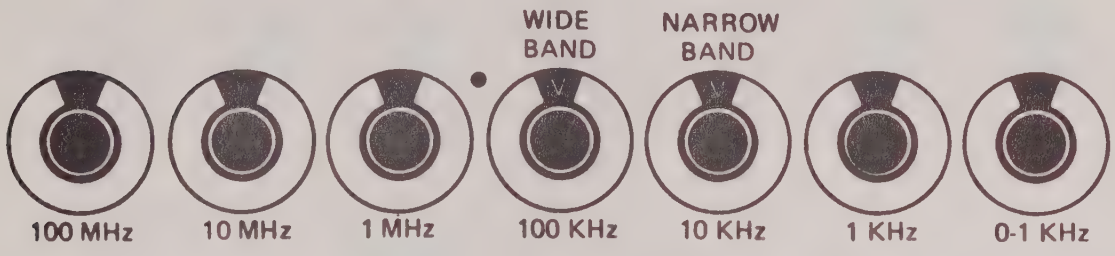



Figure 4-1. ODM Block Diagram

## 4-2. MODULATION

4-2-1. For modulation to occur, either the 100KHz or the 10KHz decade switches (on the FM-10 mainframe) must be in the V position. The 100KHz decade is set to V when the required deviation is greater than 6KHz (wideband modulation). The 10KHz decade is set to V when the deviation is less than 6KHz (narrowband modulation). (See Figure 4-2.)




| SWITCH | SWITCH POSITION | DEVIATION |
|---|---|---|
| 100KHz | V | WIDEBAND (>6 KHz) |
| 10 KHz | V | NARROWBAND (<6 KHz) |

Figure 4-2. Controls Positions for Modulation

4-2-2. When the 100KHz switch is at V, the 10KHz and 1KHz switches are inoperative. Similarily when the 10KHz is at V, the 1KHz switch is inoperative.

To compensate for the fact that these switches are inoperative, the 0-1KHz control is designed to take over their functions and is set to the value that would otherwise be set up on the decade switches. For example, suppose a frequency of 197.8326MHz is to be set for (a) narrowband deviation, and (b) wideband deviation.

a. For narrowband deviation the decades are set up as in Figure 4-3a. The 0-1KHz control is set to 3.26 to compensate for the fact that the 10KHz and 1KHz controls are inoperative.

Note: Due to lack of resolution, the 0-1KHz control can only be set to two places, so in practice it would be set to 3.2.

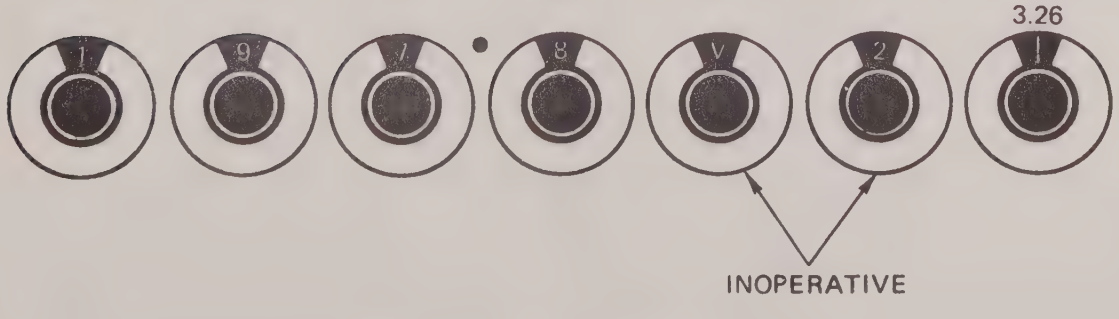



Figure 4-3a. Frequency Controls Setup

b. For wideband deviation, the decades are set up as in Figure 4-3b. The 0-1KHz control is set to 8.326 to compensate for the fact that the 100KHz, 10KHz and 1KHz controls are inoperative.

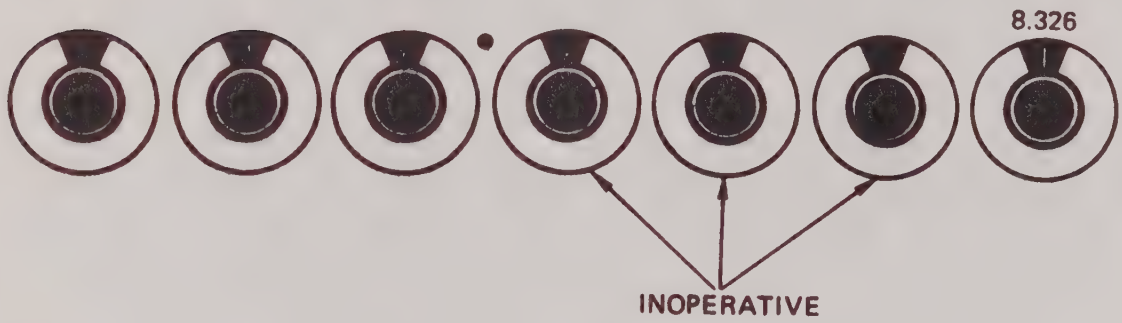



Figure 4-3b. Frequency Controls Setup

## SECTION V

## MAINTENANCE

### 5-1. GENERAL

5-1-1. Check the ODM-1 for FM deviation calibration every 90 days. The ODM-1 is self-checking and no test equipment or external connectors are required.

### 5-2. FM DEVIATION CALIBRATION CHECK PROCEDURE

5-2-1. Turn on power to ODM-1 and allow one minute warm up.

5-2-2. Set controls on FM-10 as follows:

| | |
|---|---|
| Frequency controls | 012.000 (0-1KHz control at out position) |
| 10MHz Switch | IN |

The ODM-1 operate light should now be lit.

5-2-3. Set ODM-1 controls as follows:

| | | | | |
|---|---|---|---|---|
| VERT IN | INT | ‖ | DEV RANGE | 5KHz |
| VERT GAIN | CAL (fully CW) | ‖ | MOD MODE | INT / COMB |

Set intensity and focus controls for sharpest trace. Center the trace on the CRT screen.

5-2-4. Set FM-10 frequency controls to 012.005 (0-1KHz at OUT position). The trace should move to the upper 5KHz graduation on the CRT screen. If the indicated peak deviation is not 5KHz, re-calibrate the ODM-1.

### 5-3. CALIBRATION

5-3-1. Equipment required: Patch cable, Gertsch Model PC-2653.

5-3-2. Remove the ODM-1 from the FM-10 and use the patch cable to re-connect the plug-in with the mainframe.

5-3-3. Repeat the deviation check procedure, paragraphs 5-2-1 through 5-2-4.

5-3-4. Adjust R122 on the vertical amplifier board (refer to Figure 5-1) until the trace lines up with the 5KHz graduation on the screen.

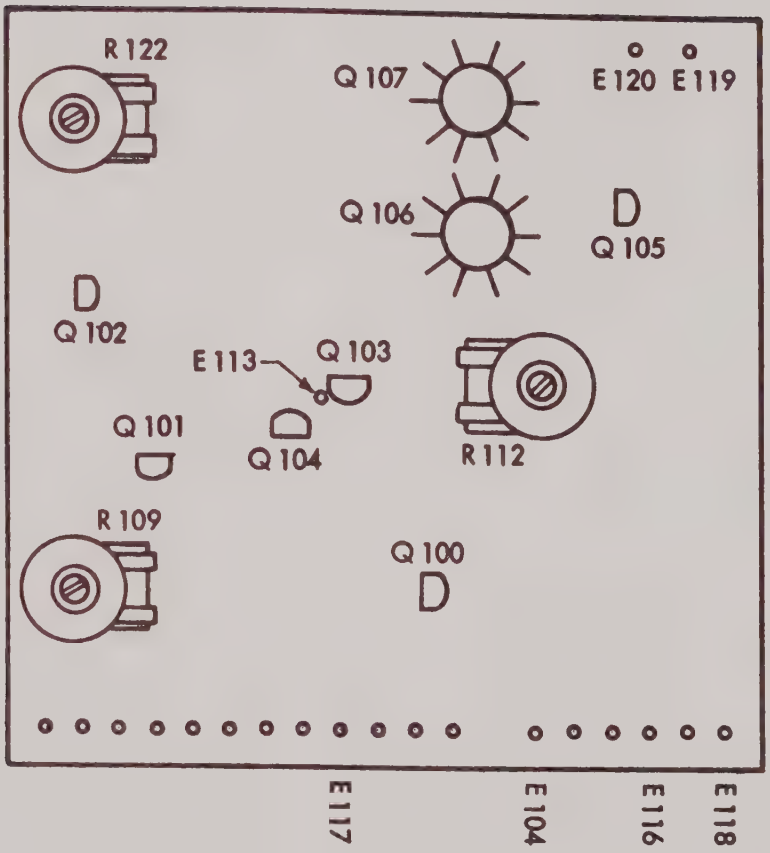
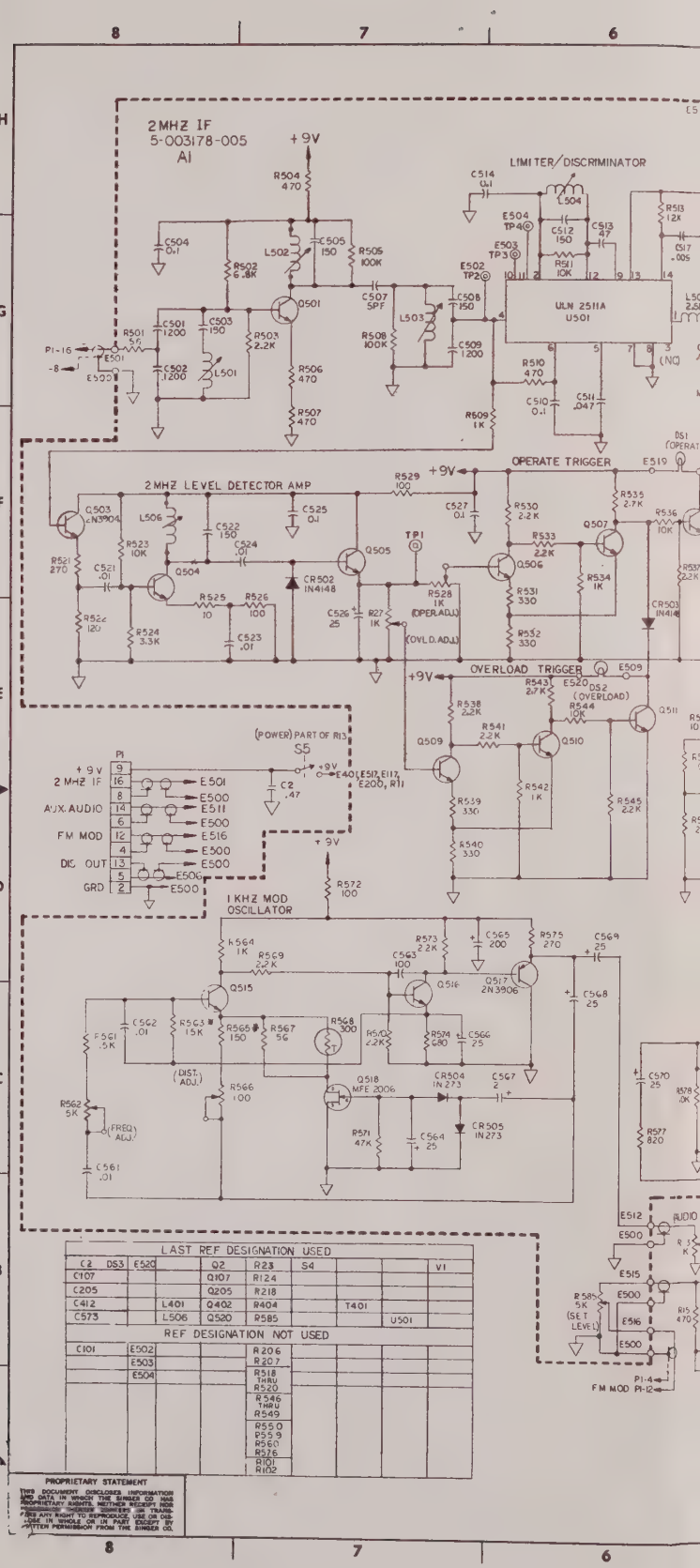



Figure 5-1. Vertical Amplifier Board

# SECTION VI

# SCHEMATIC DIAGRAM


2MHZ IF
5-003178-005
A1
+9V
LIMITER/DISCRIMINATOR
ULN 2511A
U501
2MHZ LEVEL DETECTOR AMP
OPERATE TRIGGER
OVERLOAD TRIGGER
(POWER) PART OF R13
S5
1 KHZ MOD
OSCILLATOR
LAST REF DESIGNATION USED
REF DESIGNATION NOT USED
PROPRIETARY STATEMENT

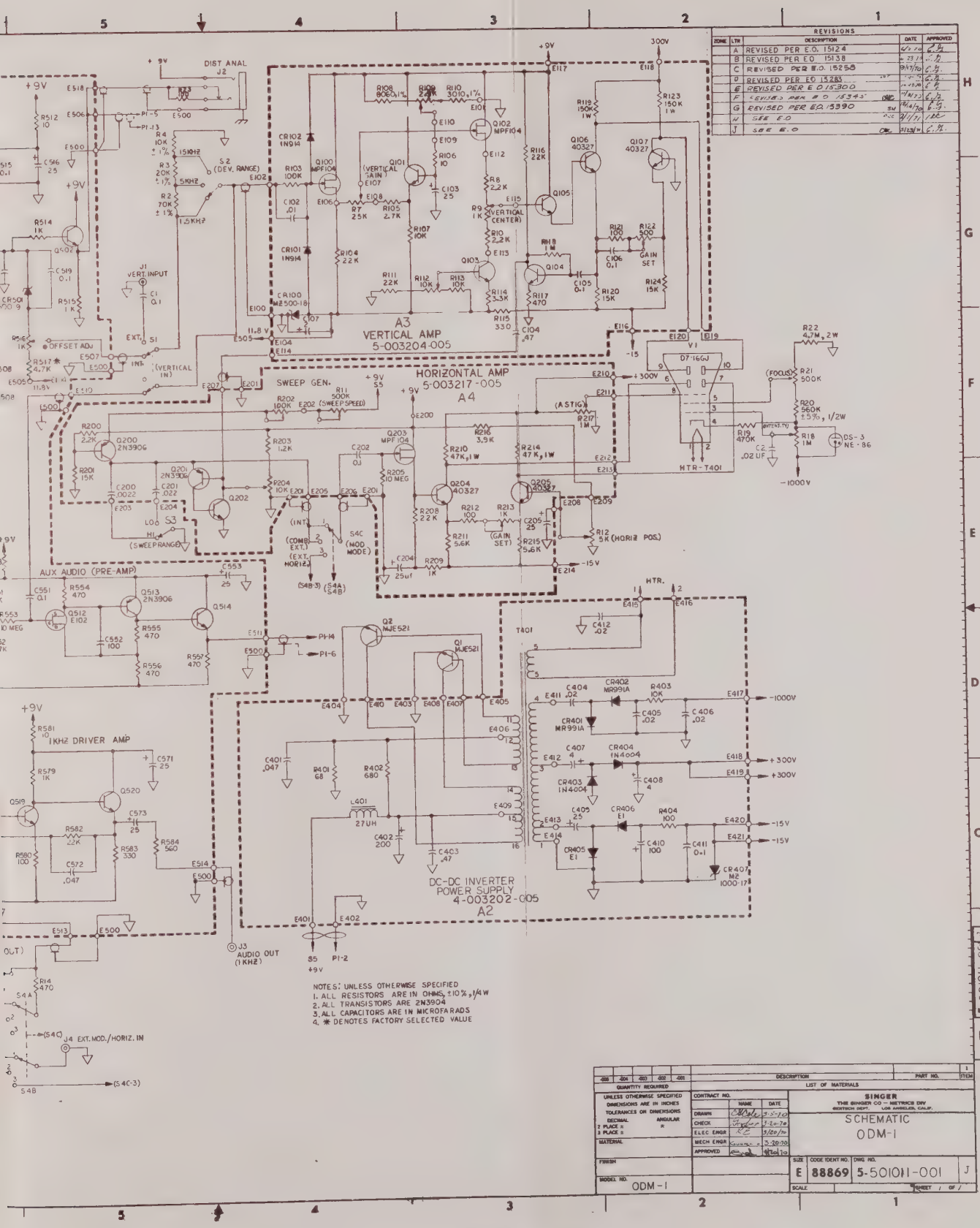
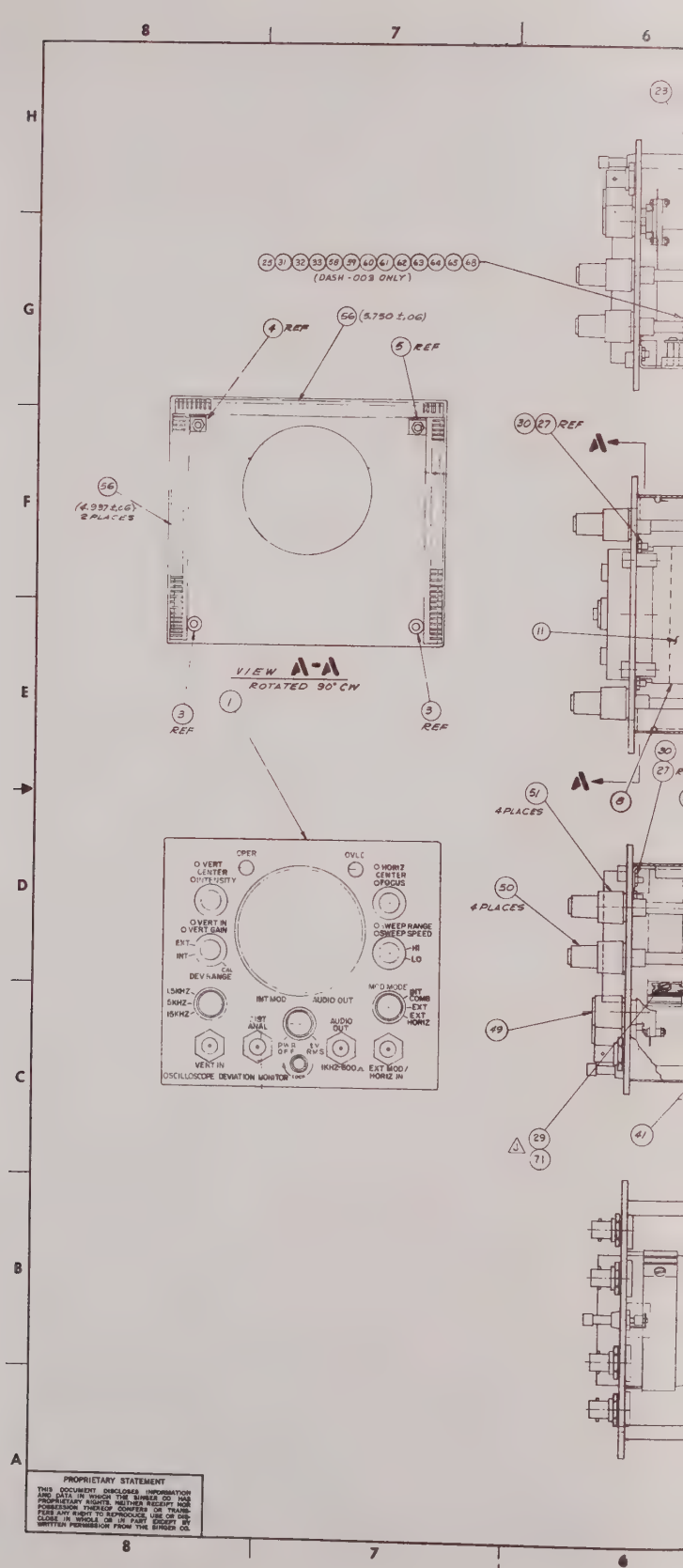



Figure 6-1. Schematic Diagram – ODM-1

# SECTION VII

# PARTS LIST

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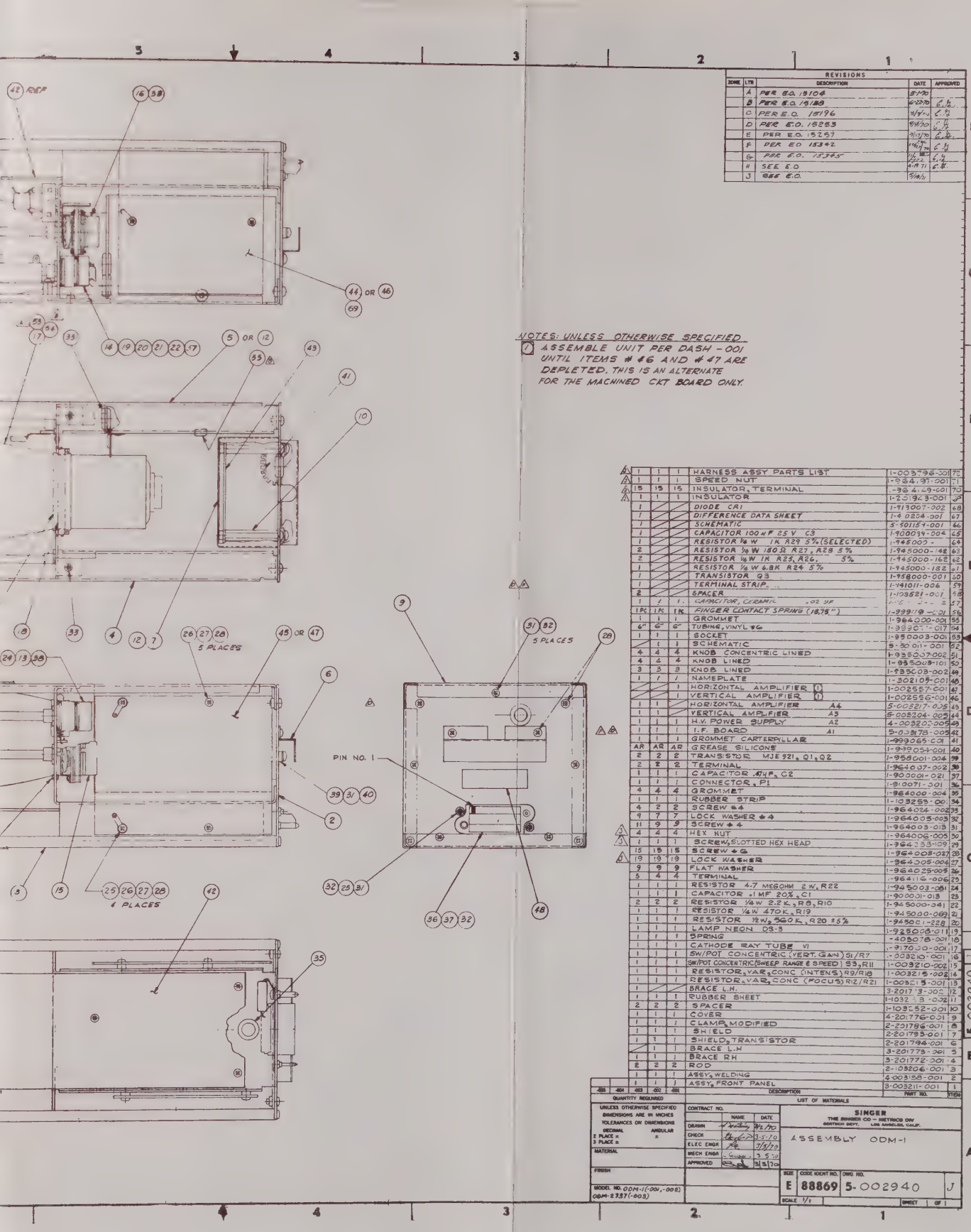
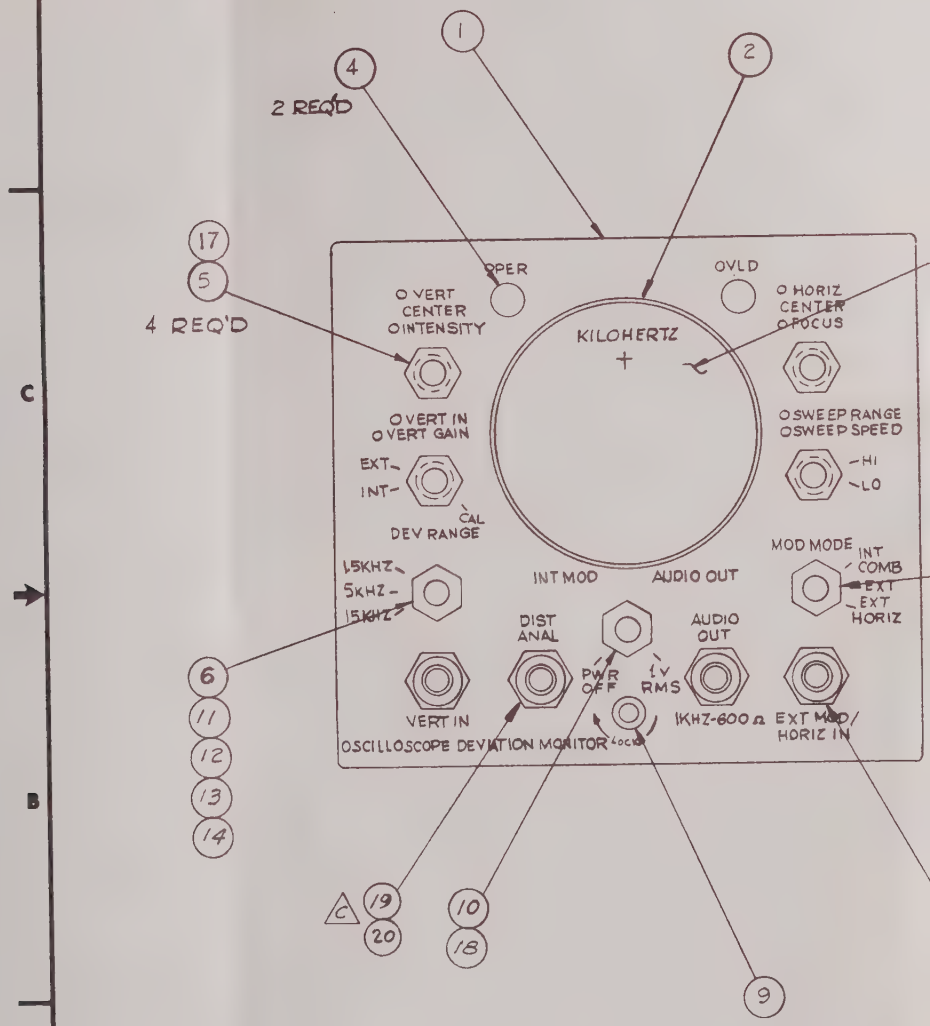

REVISIONS
NOTES: UNLESS OTHERWISE SPECIFIED
ASSEMBLE UNIT PER DASH - 001 UNTIL ITEMS # 46 AND # 47 ARE DEPLETED. THIS IS AN ALTERNATE FOR THE MACHINED CKT BOARD ONLY.
PIN NO. 1
5 PLACES
4 PLACES
ASSEMBLY ODM-1
SINGER
5-002940

Figure 7-1. Parts Location – Overall Assembly

| ISSUE | PCH. NO. | CHANGE | DATE | CHK. | ISSUE | PCH. NO. | CHANGE | DATE |
|---|---|---|---|---|---|---|---|---|
| A | | E.O 15071 | 3-24-70 | | | | | |
| B | | E.O. 15103 | 5/1/70 | | | | | |
| C | | SEE E.O. | 9/24/71 | | | | | |



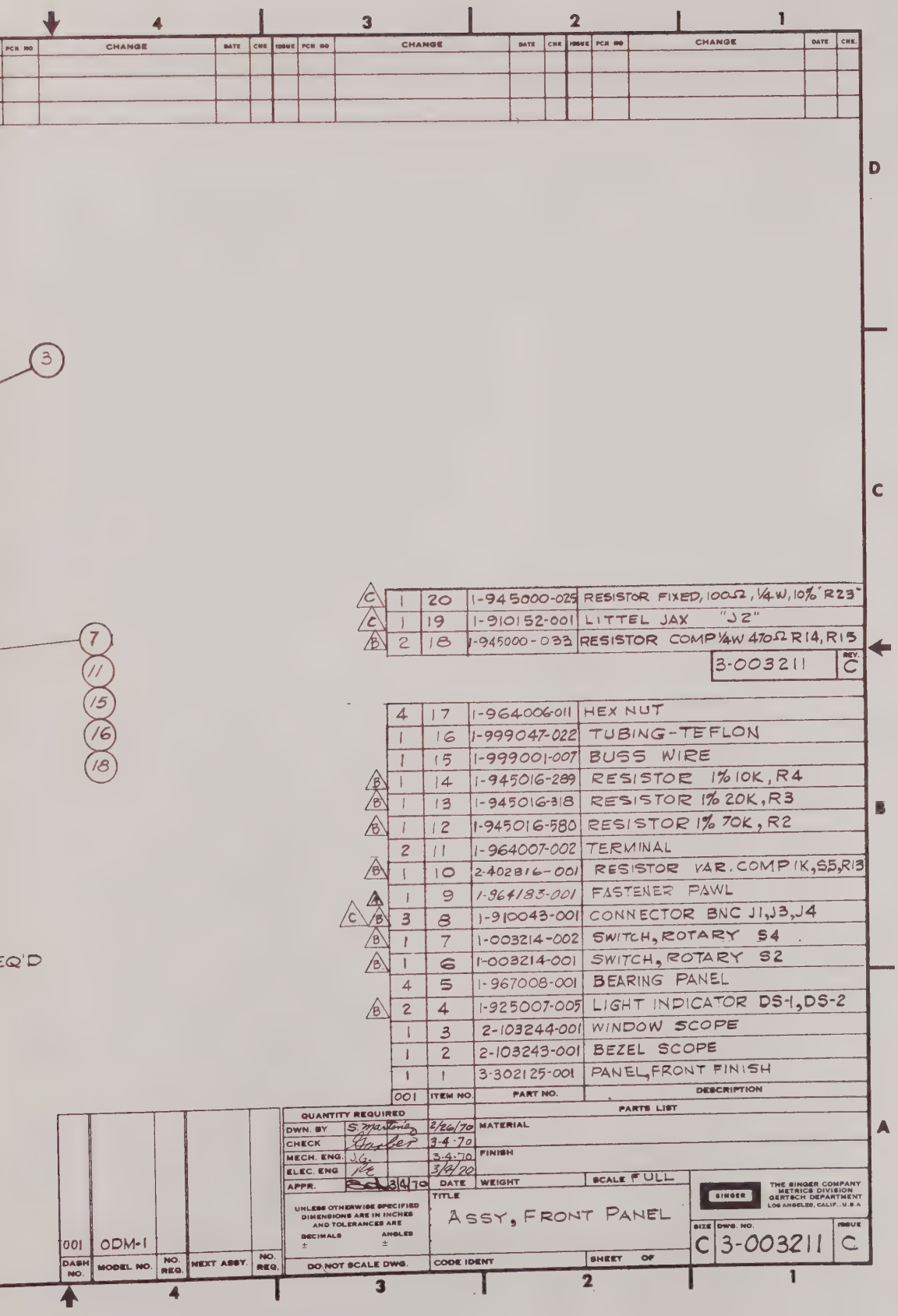



Figure 7-2. Parts Location – Front Panel

8
7
6
H
G
F
E
D
C
B
A
E512
E517
Q509
C570
E513
R577
Q519
R539
R538
R580
R578
R540
R541
R542
R579
R584
C572
C569
R543
Q510
R545
R528
E514
E519
E520
R582
C573
Q520
C568
R544
Q511
Q517
E509
R583
C563
C566
R572
R575
R573
C567
CR503
Q516
R574
R569
CR504
R581
R570
R564
C561
C565
E515
C571
E516
C562
R585
R562
Q515
R561
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Figure 7-3. Parts Location – IF Board

IF BOARD PARTS LIST
(Refer to Figure 7-3)

| REF DES | DESCRIPTION | SINGER P/N | MFR | MFR'S P/N | QTY |
|---|---|---|---|---|---|
| C501, C502 | Capacitor, Mica 5%, 500 VDC, 1200 pf | 1-900004-013 | Electro Motive Mfg. | Type DM-19 | 2 |
| C503 | Capacitor, Mica, 5%, 500VDC, 150 pf | 1-900003-034 | Electro Motive Mfg. | Type DM-19 | 1 |
| C504 | Capacitor, Met. Pl. 20%, 250 VDC, 0.1 μf | 1-900001-013 | Amperex | Type C280AE | 1 |
| C505 | Capacitor, Mica 5%, 500 VDC, 150 pf | 1-900003-034 | Electro Motive Mfg. | Type DM-15 | 1 |
| C507 | Capacitor Mica 10%, 500 VDC, 5 pf | 1-900003-004 | Electro Motive Mfg. | Type DM-15 | 1 |
| C508 | Capacitor, Mica, 5%, 500VDC, 150 pf | 1-900003-034 | Electro Motive Mfg. | Type DM-15 | 1 |
| C509 | Capacitor, Mica 5%, 500 VDC, 1200 pf | 1-900004-013 | Electro Motive Mfg. | Type DM-19 | 1 |
| C510 | Capacitor, Met. Pl. 20%, 250 VDC, 0.1 μf | 1-900001-013 | Amperex | Type C280AE | 1 |
| C511 | Capacitor, Met. Pl. 20%, 250 VDC, 0.047 μf | 1-900001-009 | Amperex | Type C280AE | 1 |
| C512 | Capacitor, Mica 5%, 500 VDC, 150 pf | 1-900003-034 | Electro Motive Mfg. | Type DM-15 | 1 |
| C513 | Capacitor, Mica 5%, 500 VDC, 47 pf | 1-900003-021 | Electro Motive Mfg. | Type DM-15 | 1 |
| C514, C515 | Capacitor, Met. Pl. 20%, 250 VDC, 0.1 μf | 1-900001-013 | Amperex | Type C280AE | 2 |
| C516 | Capacitor, Elect., 25 VDC, 25 μf | 1-900039-001 | Gen. Instr. Corp. | 984-118 | 1 |
| C517 | Capacitor, Ceramic Disc, 500 VDC, 0.005 μf | 1-900012-004 | Erie | 801Z5U5-02Z | 1 |
| C518 | Capacitor, Ceramic Disc, 500 VDC, 0.001 μf | 1-900012-002 | Erie | 861Z5U-102P | 1 |
| C519 | Capacitor, Met. Pl. 20%, 250 VDC, 0.1 μf | 1-900001-013 | Amperex | Type C280AE | 1 |
| C521 | Capacitor, Met. Pl. 20%, 250 VDC, 0.010 μf | 1-900001-001 | Amperex | Type C280AE | 1 |
| C522 | Capacitor, Mica 5%, 500 VDC, 150 pf | 1-900003-034 | Electro Motive Mfg. | Type DM-15 | 1 |

| REF DES | DESCRIPTION | SINGER P/N | MFR | MFR'S P/N | QTY |
|---|---|---|---|---|---|
| C523, C524 | Capacitor, Met. Pl. 20%, 250 VDC, 0.010 μf | 1-900001-001 | Amperex | Type C280AE | 2 |
| C525 | Capacitor, Met. Pl. 20%, 250 VDC, 0.1 μf | 1-900001-013 | Amperex | Type C280AE | 1 |
| C526 | Capacitor, Elect., 25 VDC, 25 μf | 1-900039-001 | Gen. Instr. Corp. | 984-118 | 1 |
| C527 | Capacitor, Met. Pl. 20%, 250 VDC, 0.1 μf | 1-900001-013 | Amperex | Type C280AE | 1 |
| C551 | Capacitor, Met. Pl. 20%, 250 VDC, 0.1 μf | 1-900001-013 | Amperex | Type C280AE | 1 |
| C552 | Capacitor, Mica, 5%, 500 VDC, 100 pf | 1-900003-030 | Electro Motive Mfg. | Type DM-15 | 1 |
| C553 | Capacitor, Elect., 25 VDC, 25 μf | 1-900039-001 | Gen. Instr. Corp. | 984-118 | 1 |
| C561, C562 | Capacitor, Met. Pl. 20%, 250 VDC, 0.01 μf | 1-900001-001 | Amperex | Type C280AE | 1 |
| C563 | Capacitor, Mica, 5%, 500 VDC, 100 pf | 1-900003-030 | Electro Motive Mfg. | Type DM-15 | 1 |
| C564 | Capacitor, Elect., 25 VDC, 25 μf | 1-900039-001 | Gen. Instr. Corp. | 984-118 | 1 |
| C565 | Capacitor, Elect., 25 VDC, 200 μf | 1-900039-002 | Gen. Instr. Corp. | 984-141 | 1 |
| C566 | Capacitor, Elect., 25 VDC, 25 μf | 1-900039-001 | Gen. Instr. Corp. | 984-118 | 1 |
| C567 | Capacitor, Elect., 25 VDC, 2 μf | 1-900023-016 | Sprague | TE-1201 | 1 |
| C568 – C571 | Capacitor, Elect., 25 VDC, 25 μf | 1-900039-001 | Gen. Instr. Corp. | 984-118 | 4 |
| C572 | Capacitor, Met. Pl., 20%, 250 VDC, 0.047 μf | 1-900001-009 | Amperex | Type C280AE | 1 |
| C573 | Capacitor, Elect., 25 VDC, 25 μf | 1-900039-001 | Gen. Instr. Corp. | 984-118 | 1 |
| CR501 | Diode, Zener | 1-913003-009 | Motorola | MZ- | 1 |
| CR502, CR503 | Diode | 1-913007-001 | G.E. | 1N 4148 | 2 |

| REF DES | DESCRIPTION | SINGER P/N | MFR | MFR'S P/N | QTY |
|---|---|---|---|---|---|
| CR504, CR505 | Diode, Zener | 1-913005-001 | Transitron Elect. Corp. | 1N 273 | 1 |
| L501 L504 | Inductor, Variable, 30 - 60 μH | 1-906006-003 | Precision Coil Corp. | L57-2CT F4 | 1 |
| L505 | Inductor, Fixed, 2.5 μH | 1-906002-054 | J.W. Miller Co. | 70F253AI | 1 |
| L506 | Inductor, Variable, 30 - 60 μH | 1-906006-003 | Precision Coil Corp. | L57-2CT F4 | 1 |
| Q501 – Q511 | Transistor | 1-958000-001 | Motorola | 2N 3904-5 | 11 |
| Q512 | Transistor, FET | 1-958031-003 | Siliconics | E 102 | 1 |
| Q513 | Transistor | 1-958000-002 | Motorola | 2N 3906-5 | 1 |
| Q514 – Q516 | Transistor | 1-958000-001 | Motorola | 2N 3904-5 | 3 |
| Q517 | Transistor | 1-958000-002 | Motorola | 2N 3906-5 | 1 |
| Q518 | Transistor, FET | 1-958044-003 | Motorola, Semiconductor Division | MFE 2006 | 1 |
| Q519, Q520 | Transistor | 1-958000-001 | Motorola | 2N 3904-5 | 1 |
| R501 | Resistor, carbon, 1/4W, 10%, 56 Ω | 1-945000-022 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R502 | Resistor, carbon, 1/4W, 10%, 6.8K | 1-945000-047 | Allen-Bradley Co. | H401121 | 1 |
| R503 | Resistor, carbon, 1/4W, 10%, 2.2K | 1-945000-041 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R504 | Resistor, carbon, 1/4W, 10%, 470 ohms | 1-945000-033 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R505 | Resistor, carbon, 1/4W, 10%, 100K | 1-945000-061 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R506, R507 | Resistor, carbon, 1/4W, 10%, 470 ohms | 1-945000-033 | Allen-Bradley Co. | Type CB H401121 | 2 |
| R508 | Resistor, carbon, 1/4W, 10%, 100K | 1-945000-061 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R509 | Resistor, carbon, 1/4W, 10%, 1K | 1-945000-041 | Allen-Bradley Co. | Type CB H401121 | 1 |

| REF DES | DESCRIPTION | SINGER P/N | MFR. | MFR'S P/N | QTY |
|---|---|---|---|---|---|
| R510 | Resistor, carbon, 1/4W, 10%, 470 ohms | 1-945000-033 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R511 | Resistor, carbon, 1/4W, 10%, 10K | 1-945000-049 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R512 | Resistor, carbon, 1/4W, 10%, 10 ohms | 1-945000-013 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R513 | Resistor, carbon, 1/4W, 10%, 12K | 1-945000-050 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R514, R515 | Resistor, carbon, 1/4W, 10%, 1K | 1-945000-037 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R516 | Resistor, Variable, ± 30%, 1K | 1-945007-004 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R517 | Resistor, carbon, 1/4W, 10%, 10K | 1-945000-049 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R521 | Resistor, carbon, 1/4W, 10%, 270 ohms | 1-945000-030 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R522 | Resistor, carbon, 1/4W, 10%, 120 ohms | 1-945000-026 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R523 | Resistor, carbon, 1/4W, 10%, 10K | 1-945000-049 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R524 | Resistor, carbon, 1/4W, 10%, 3.3K | 1-945000-043 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R525 | Resistor, carbon, 1/4W, 10%, 10 ohms | 1-945000-013 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R526 | Resistor, carbon, 1/4S, 10%, 100 ohms | 1-945000-025 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R527, R528 | Resistor, variable, ± 10%, 1K | 1-945056-007 | Allen-Bradley Co. | Type CB H401121 | 2 |
| R529 | Resistor, carbon, 1/4W, 10%, 100 ohms | 1-945000-025 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R530 | Resistor, carbon, 1/4W, 10%, 2.2K | 1-945000-041 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R531, R532 | Resistor, carbon, 1/4W, 10%, 330 Ω | 1-945000-031 | Allen-Bradley Co. | Type CB H401121 | 2 |
| R533 | Resistor, carbon, 1/4W, 10%, 2.2K | 1-945000-041 | Allen-Bradley Co. | Type CB H401121 | 1 |

| REF DES | DESCRIPTION | SINGER P/N | MFR | MFR'S P/N | QTY |
|---|---|---|---|---|---|
| R534 | Resistor, carbon, 1/4W, 10%, 1K | 1-945000-037 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R535 | Resistor, carbon, 1/4W, 10%, 2.7K | 1-945000-042 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R536 | Resistor, carbon, 1/4W, 10%, 10K | 1-945000-049 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R537, R538 | Resistor, carbon, 1/4W, 10%, 2.2K | 1-945000-041 | Allen-Bradley Co. | Type CB H401121 | 2 |
| R539, R540 | Resistor, carbon, 1/4W, 10%, 330 Ω | 1-945000-031 | Allen-Bradley Co. | Type CB H401121 | 2 |
| R541 | Resistor, carbon, 1/4W, 10%, 2.2K | 1-945000-041 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R542 | Resistor, carbon, 1/4W, 10%, 1K | 1-945000-037 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R543 | Resistor, carbon, 1/4W, 10%, 2.7K | 1-945000-042 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R544 | Resistor, carbon, 1/4W, 10%, 10K | 1-945000-049 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R545 | Resistor, carbon, 1/4W, 10%, 2.2K | 1-945000-041 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R551 | Resistor, carbon, 1/4W, 10%, 10K | 1-945000-049 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R552 | Resistor, carbon, 1/4W, 10%, 2.7K | 1-945000-042 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R553 | Resistor, carbon, 1/4W, 10%, 10 M | 1-945000-085 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R554 – R557 | Resistor, carbon, 1/4W, 10%, 470 Ω | 1-945000-033 | Allen-Bradley Co. | Type CB H401121 | 4 |
| R558 | Resistor, carbon, 1/4W, 10%, 10 Ω | 1-945000-013 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R561 | Resistor, carbon, 1/4W, 10%, 15K | 1-945000-051 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R562 | Resistor, variable, ± 30%, 5K | 1-945007-006 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R563 | Resistor, carbon, 1/4W, ± 10%, 15K | 1-945000-051 | Allen-Bradley Co. | Type CB H401121 | 1 |

| REF DES | DESCRIPTION | SINGER P/N | MFR | MFR'S P/N | QTY |
|---|---|---|---|---|---|
| R564 | Resistor, carbon, 1/4W, ± 10%, 1K | 1-945000-037 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R565 | Resistor, carbon, 1/4W, ± 10%, 150 Ω | 1-945000-027 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R566 | Resistor, variable, ± 30%, 100 Ω | 1-945007-001 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R567 | Resistor, carbon, 1/4W, ± 10%, 56 Ω | 1-945000-022 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R568 | Resistor, thermistor, 300 Ω | 1-945070-001 | Corning | Type C20 ± 2% Tol. | 1 |
| R569, R570 | Resistor, carbon, 1/4W, 10%, 10M | 1-945000-041 | Allen-Bradley Co. | Type CB H401121 | 2 |
| R571 | Resistor, carbon, 1/4W, 10%, 47K | 1-945000-057 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R572 | Resistor, carbon, 1/4W, 10%, 100 Ω | 1-945000-025 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R573 | Resistor, carbon, 1/4W, 10%, 2.2K | 1-945000-041 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R574 | Resistor, carbon, 1/4W, 10%, 680 Ω | 1-945000-035 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R575 | Resistor, carbon, 1/4W, 10%, 270 Ω | 1-945000-030 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R577 | Resistor, carbon, 1/4W, 10%, 820 Ω | 1-945000-036 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R578 | Resistor, carbon, 1/4W, 10%, 10K | 1-945000-049 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R579 | Resistor, carbon, 1/4W, 10%, 1K | 1-945000-037 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R580 | Resistor, carbon, 1/4W, 10%, 100 Ω | 1-945000-025 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R581 | Resistor, carbon, 1/4W, 10%, 10 Ω | 1-945000-013 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R582 | Resistor, carbon, 1/4W, 10%, 22K | 1-945000-053 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R583 | Resistor, carbon, 1/4W, 10%, 330 Ω | 1-945000-031 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R584 | Resistor, carbon, 1/4W, 10%, 560 Ω | 1-945000-034 | Allen-Bradley Co. | Type CB H401121 | 1 |
| U 501 | Integrated Circuit, Disc | 1-926031-001 | | | 1 |

5-003204-005 REV
REDUCE TO
6.250 ±.005 BETWEEN TARGET CENTERS
E114
E112
E107
E101
E110
E109
E111
E108
E117
E106
E103
E105
E118
E115
E116
E100
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C103
C104
C107
C106
C105
Q102
Q101
Q104
Q103
Q100
Q106
Q107
Q105
CR102
CR100
CR101
R117
R111
R112
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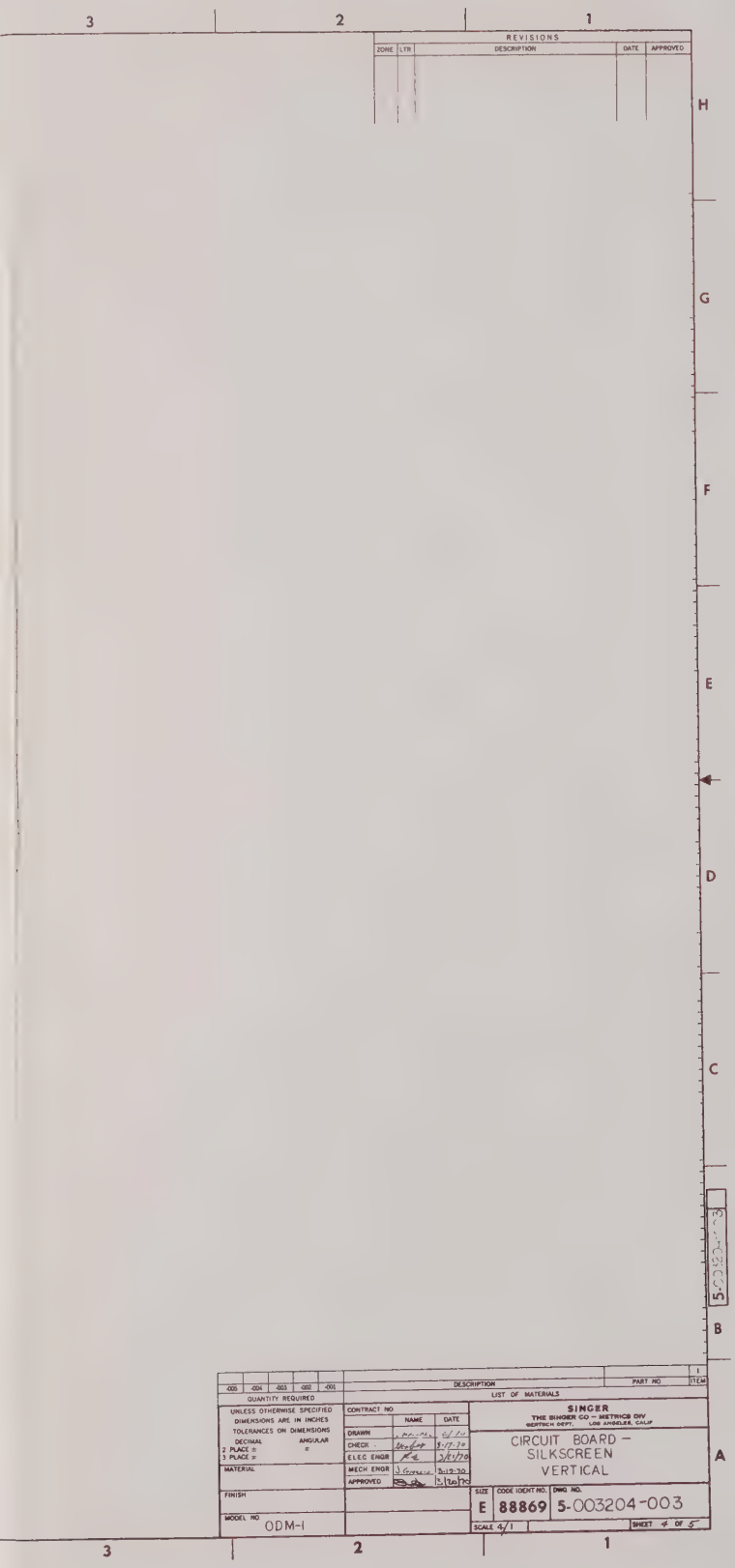



Figure 7-4. Parts Location – Vertical Amplifier Board

## VERTICAL AMPLIFIER BOARD PARTS LIST
(Refer to Figure 7-4)

| REF DES | DESCRIPTION | SINGER P/N | MFR | MFR'S P/N | QTY |
|---|---|---|---|---|---|
| C100 | Capacitor, Dipped Mica Size 15 | 1-900003-021 | Electromotive Mfg. | Type DM-15 | 1 |
| C101 | Capacitor, Variable ceramic | 1-900031-001 | Erie | 538-011-2-8PFA | 1 |
| C102 | Capacitor, Metalized Plastic | 1-900001-001 | Amperex | Type C280AE | 1 |
| C103 | Capacitor, Electrolytic | 1-900000-021 | Wima | Type Printilyt | 1 |
| C104, C105 | Capacitor, Metalized Plastic | 1-900001-013 | Amperex | Type C280AE | 2 |
| CR100 | Diode, Zener | 1-913003-020 | Motorola | | 1 |
| CR101, CR102 | Diode | 1-913000-001 | Texas Instruments | 1N 914 | 2 |
| Q100 | Transistor, Junction Field Effect | 1-958002-002 | Motorola | MPF 104-5 | 1 |
| Q101 | Transistor | 1-958000-001 | Motorola | 2N3904-5 | 1 |
| Q102 | Transistor, Junction Field Effect | 1-958002-002 | Motorola | MPF 104-5 | 1 |
| Q103, Q104, Q105 | Transistor | 1-958000-001 | Motorola | 2N3904-5 | 3 |
| Q106, Q107 | Transistor | 1-958004-001 | RCA | 40327 | 2 |
| R100 | Resistor, Composition, 1/4W | 1-945000-061 | Allen-Bradley Co. | Type CB | 1 |
| R101 | Resistor, Composition, 1/4W | 1-945000-085 | Allen-Bradley Co. | Type CB | 1 |
| R102 | Resistor, Composition, 1/4W | 1-945000-073 | Allen-Bradley Co. | Type CB | 1 |
| R103 | Resistor, Composition, 1/4W | 1-945000-061 | Allen-Bradley Co. | Type CB | 1 |
| R104 | Resistor, Composition, 1/4W | 1-945000-053 | Allen-Bradley Co. | Type CB | 1 |
| R105 | Resistor, Composition, 1/4W | 1-945000-037 | Allen-Bradley Co. | Type CB | 1 |
| R106 | Resistor, Composition, 1/4W | 1-945000-013 | Allen-Bradley Co. | Type CB | 1 |
| R107 | Resistor, Composition, 1/4W | 1-945000-049 | Allen-Bradley Co. | Type CB | 1 |
| R108 | Resistor, Composition, 1/4W | 1-945000-036 | Allen-Bradley Co. | Type CB | 1 |
| R109 | Resistor, Variable Comp. Perpend. | 1-945006-007 | Mallory & Co. | MTC 13L1 | 1 |
| R110 | Resistor, Variable Comp., Paralleled | 1-945005-007 | Mallory & Co. | MTC 13L4 | 1 |

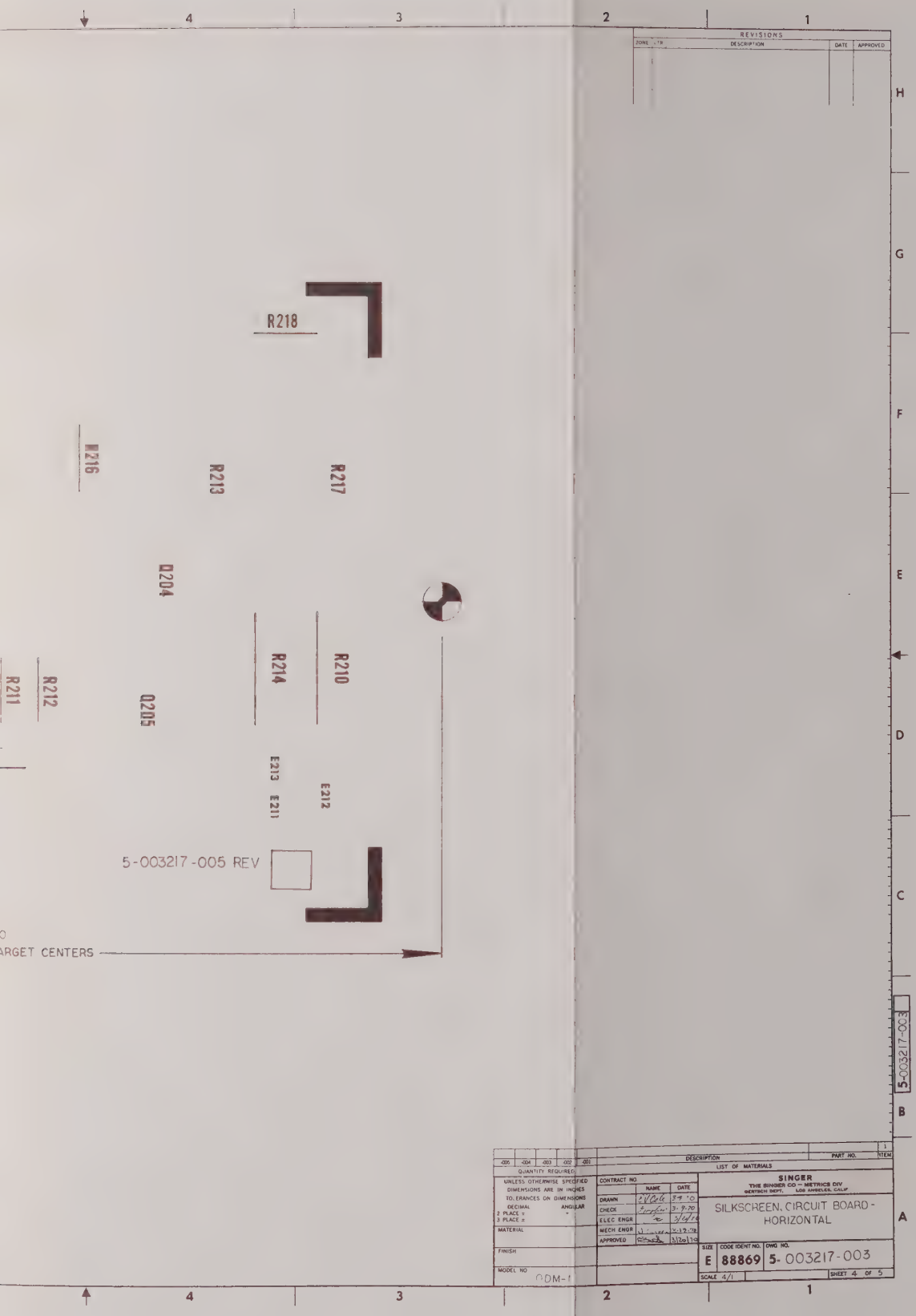


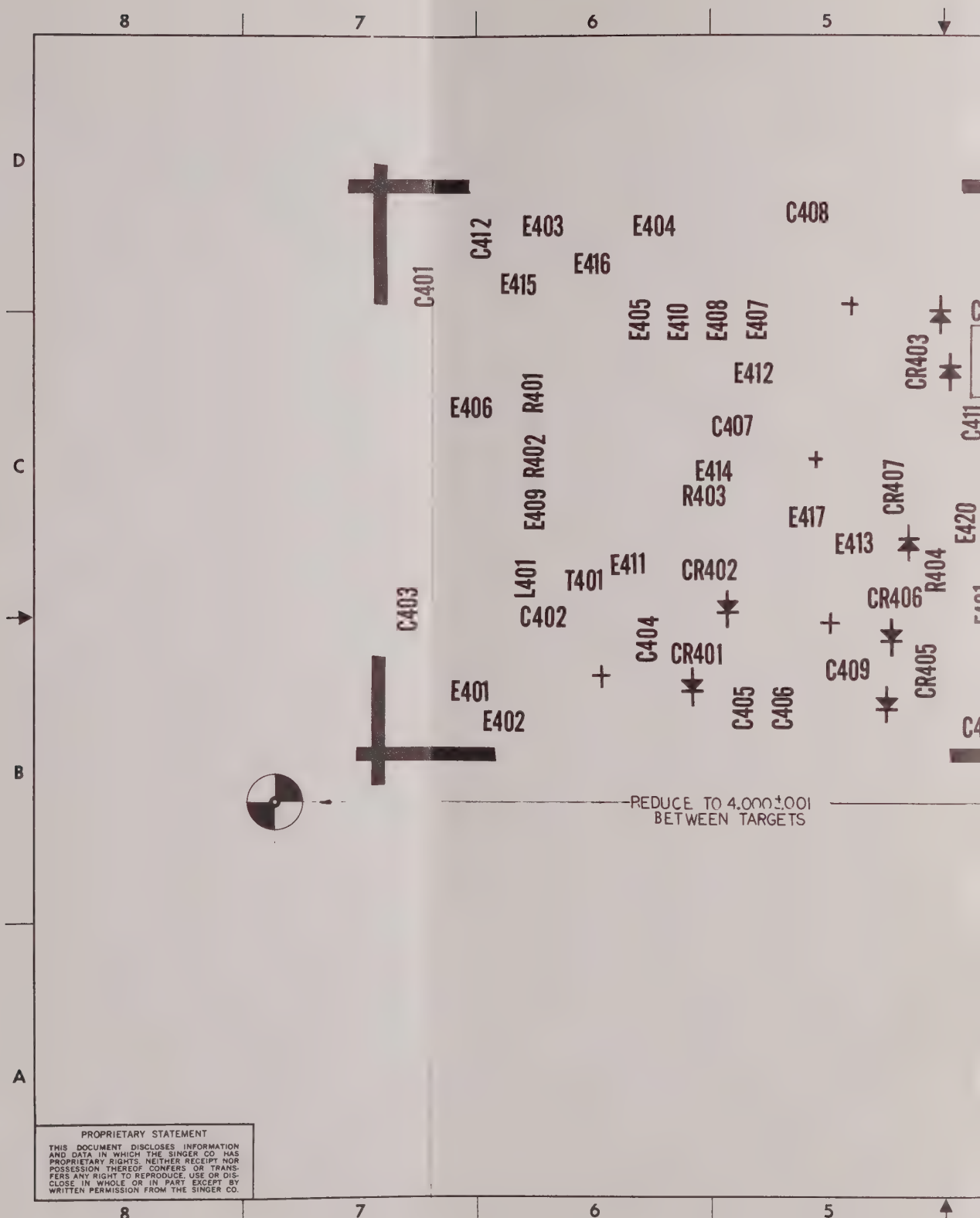

Figure 7-5. Parts Location – Horizontal Amplifier Board

## HORIZONTAL AMPLIFIER BOARD PARTS LIST

(Refer to Figure 7-5)

| REF DES | DESCRIPTION | SINGER P/N | MFR | MFR'S P/N | QTY |
|---|---|---|---|---|---|
| C200 | Capacitor, Dipped Plastic, Non-Inductive | 1-900005-101 | Mallory & Co. | Type PVC | 1 |
| C201 | Capacitor, Dipped Plastic, Non-Inductive | 1-900005-004 | Mallory & Co. | Type PVC | 1 |
| C202, C203 | Capacitor, Metalized Plastic | 1-900001-013 | Amperex | Type C280AE | 2 |
| C204, C205 | Capacitor, Electrolytic | 1-900000-021 | Wima | Type Printilyt | 2 |
| CR200, CR201 | Diode | 1-913005-001 | Texas Instruments | 1N 273 | 2 |
| Q200, Q201 | Transistor | 1-958000-002 | Motorola | 2N3906-5 | 2 |
| Q202 | Transistor | 1-958000-001 | Motorola | 2N3904-5 | 1 |
| Q203 | Transistor, Junction Field Effect | 1-958002-002 | Motorola | MPF 104-5 | 1 |
| Q204, Q205 | Transistor | 1-958004-001 | RCA | 40327 | 2 |
| R200 | Resistor, Composition, 1/4W | 1-945000-041 | Allen-Bradley | Type CB | 1 |
| R201 | Resistor, Composition, 1/4W | 1-945000-051 | Allen-Bradley | Type CB | 1 |
| R202 | Resistor, Variable Comp., Parallel | 1-945005-019 | Mallory & Co. | MTC 54L4 | 1 |
| R203 | Resistor, Composition, 1/4W | 1-945000-053 | Allen-Bradley | Type CB | 1 |
| R204 | Resistor, Variable Comp., Parallel | 1-945000-015 | Mallory & Co. | MTC 14L4 | 1 |
| R205 | Resistor, Composition, 1/4W | 1-945000-085 | Allen-Bradley | Type CB | 1 |
| R206 | Resistor, Composition, 1/4W | 1-945000-049 | Allen-Bradley | Type CB | 1 |
| R207, R208 | Resistor, Composition, 1/4W | 1-945000-053 | Allen-Bradley | Type CB | 2 |
| R209 | Resistor, Composition, 1/4W | 1-945000-037 | Allen-Bradley | Type CB | 1 |
| R210 | Resistor, Composition, 1W | 1-945002-057 | Allen-Bradley | Type GB | 1 |
| R211 | Resistor, Composition, 1/4W | 1-945000-046 | Allen-Bradley | Type CB | 1 |
| R212 | Resistor, Composition, 1/4W | 1-945000-029 | Allen-Bradley | Type CB | 1 |
| R213 | Resistor, Variable Comp., Paralleled | 1-945005-007 | Mallory & Co. | MTC 13L4 | 1 |
| R214 | Resistor, Composition, 1W | 1-945002-057 | Allen-Bradley | Type GB | 1 |
| R215 | Resistor, Composition, 1/4W | 1-945000-046 | Allen-Bradley | Type CB | 1 |
| R216 | Resistor, Composition, 1/4W | 1-945000-044 | Allen-Bradley | Type CB | 1 |

| REF DES | DESCRIPTION | SINGER P/N | MFR | MFR'S P/N | QTY |
|---|---|---|---|---|---|
| R217 | Resistor, variable Comp., Parallel | 1-945005-027 | Mallory & Co. | MTC 16L4 | 1 |
| R218 | Resistor, Composition, 1/4W | 1-945000-061 | Allen-Bradley | Type CB | 1 |

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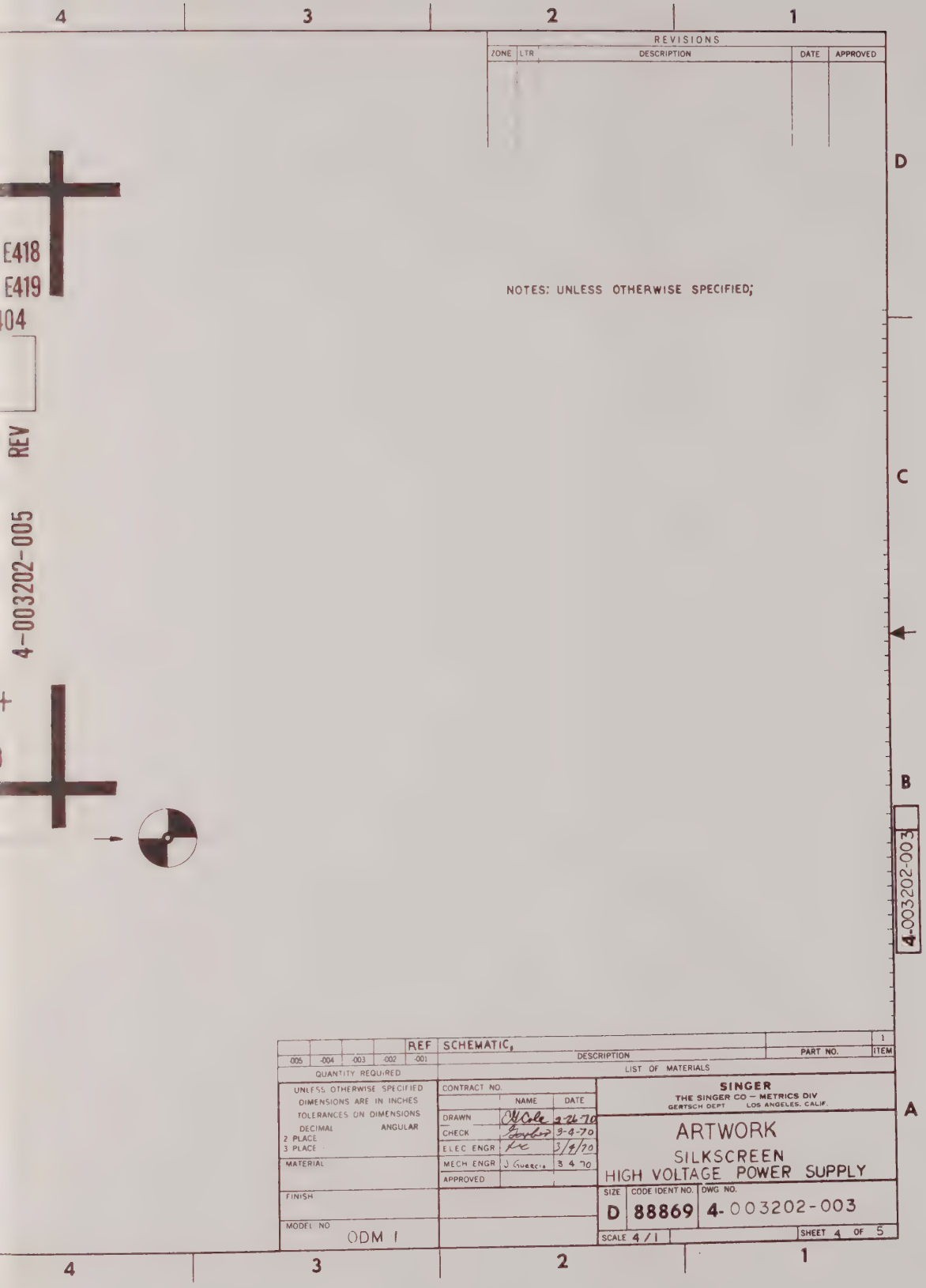



Figure 7-6. Parts Location – HV Power Supply Board

## HV POWER SUPPLY BOARD PARTS LIST
(Refer to Figure 7-6)

| REF DES | DESCRIPTION | SINGER P/N | MFR | MFR'S P/N | QTY |
|---|---|---|---|---|---|
| C401 | Capacitor, Metl. Pl.±20% 250V, 0.047μf | 1-900001-009 | Amperex | Type C280AE | 1 |
| C402 | Capacitor Elect 15V, 200μf | 1-900039-002 | Gen. Instr. Corp. | 984-141 | 1 |
| C403 | Capacitor, Metl. Pl.±20% 250V, 0.47μf | 1-900001-021 | Amperex | Type C280AE | 1 |
| C404, C405 C406 | Capacitor, Cer. Disc.,±20% 1000V, 0.02μf | 1-900012-012 | Sprague | 5GA-520 | 3 |
| C407, C408 | Capacitor, Elect. 350V, 4μf | 1-900011-001 | Cornell Dubilier | Type BR | 2 |
| C409 | Capacitor, Elect. 35V, 25μf | 1-900000-021 | Wima | Type Printilyt | 1 |
| C410 | Capacitor, Elect. 25V, 100μf | 1-900039-004 | Gen. Instr. Corp. | 984-130 | 1 |
| C411 | Capacitor, Cer. Disc. 0.1μf | 1-900012-005 | Sprague | 41C92 | 1 |
| C412 | Capacitor, Cer. Disc. ±20% 1000V, 0.02μf | 1-900012-012 | Sprague | 5GA-520 | 1 |
| CR401, CR402 | Diode MR991A | 1-913043-002 | Motorola | MR991A | 2 |
| CR403, CR404 | Diode E4 | 1-913002-003 | Sarkes Tarzian | E4 | 2 |
| CR405, CR406 | Diode E1 | 1-913002-001 | Sarkes Tarzian | E1 | 2 |
| CR407 | Diode MZ1000-17 | 1-913004-017 | Motorola | Type MZ | 1 |
| L401 | Inductor, Filter | 1-003213-001 | Gertsch | | 1 |
| R401 | Resistor Comp, 1/4W 10% 68Ω | 1-945000-023 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R402 | Resistor Comp, 1/4W 10% 680Ω | 1-945000-035 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R403 | Resistor Comp, 1/4W 10% 10K | 1-945000-049 | Allen-Bradley Co. | Type CB H401121 | 1 |
| R404 | Resistor Comp, 1/4W 10% 100Ω | 1-945000-025 | Allen-Bradley Co. | Type CB H401121 | 1 |
| T401 | Transformer | 1-003206-001 | Gertsch | | 1 |

ADDENDUM #1
to
INSTRUCTION MANUAL NO. 1-500783-157(Rev. C)
OSCILLOSCOPE DEVIATION MONITOR
MODEL ODM-1

1. ADDENDUM:

Make the necessary changes, additions or delections as follows:

a. Page 7-4, IF Board Parts List

| | |
|---|---|
| Ref Desig: | C501, C502 Capacitor Mica |
| Change: | Singer P/N 1-900004-013 |
| to: | Singer P/N 1-900003-057, 1200pf ±5%, 500 vdc |
| Change: | Mfr P/N type DM-19 |
| to: | Mfr P/N type DM-15 |

b. Page 7-5

| | |
|---|---|
| Ref Desig | CR501 Diode, Zener |
| Change: | Singer P/N 1-913003-009 |
| to: | Singer P/N 1-913030-010 Zener Diode 4.7v nom.±5% tol. |
| Change: | Motorola P/N MZ |
| to: | Motorola P/N 1N5230B |

c. Page 7-11, Vertical Amplifier Board Parts Lists

| | |
|---|---|
| Ref Desig: | Q100 Transistor, Junction Field Effect |
| Change: | Q100 |
| to: | Q100 and Q102, Transistor, Junction Field Effect |
| Change: | Motorola P/N MPF 104-5 |
| to: | Motorola P/N 2N5458 |
| Change Qty: | in Quantity column, from 1 to 2 |
| Delete: | Q102 line in its entirety |

Ref Desig, R108, Resistor, Composition, 1/4W

| | |
|---|---|
| Change: | Singer P/N 1-945000-036 |
| to: | Singer P/N 1-945016-280,<br>Resistor, Fixed Film; 8.06 ohm ±1% 1/4W<br>MIL type RN60D8060F |
| Delete: | Allen Bradley type CB |

REVISED
APPROVED

9-71

| | | |
|---|---|---|
| | Ref Desig: | R109, Resistor, Variable Composition |
| | Change: | Singer P/N 1-945006-007 |
| | to: | Singer P/N 1-945010-106 |
| | | Resistor, Variable; 5K ohms, ±30%, 1/4W |
| | | CTS type U201-5K ohms |
| | Delete: | Mallory & Co. type MTC-13L1 |
| d. | Ref Desig: | R110, Resistor Variable |
| | Change: | Singer P/N 1-945005-007 |
| | to: | Singer P/N 1-945016-193 |
| | | Resistor, Fixed Film, 1K ohm ±1%, 1/4W |
| | | MIL type RN60D 1001F |
| | Delete: | Mallory & Co. type MTC-13L4 |
| e. | Page 7-12 | |
| | Ref Desig: | R111, Resistor Composition |
| | Change: | Singer P/N 1-945000-041 |
| | to: | Singer P/N 1-945000-049 |
| | | Resistor Composition, 10K ohm ±10%, 1/4W |
| f. | Page 7-14 | Horizontal Amp. Board, Parts List |
| | Ref Desig: | Q203, Transistor, Field Effect |
| | Change: | Motorola P/N MPF104-5 |
| | to: | Motorola P/N 2N5458 |
| g. | Page 7-17 | HV Power Supply Board, Parts Lists |
| | Ref Desig: | CR403 and CR404 Diode |
| | Change: | Singer P/N 1-913002-003 |
| | to: | Singer P/N 1-913001-003 |
| | | Diode type IN4003 |
| | Change: | Sarkes Tarzian P/N E4 |
| | to: | Motorola type IN4003 |
| | Ref Desig: | CR405 and CR406 Diode |
| | Change: | Singer P/N 1-913002-001 |
| | to: | Singer P/N 1-913001-001 |
| | | Diode type IN4001 |
| | Change: | Sarkes Tarzian P/N E1 |
| | to: | Motorola type IN4001 |

REVISED

APPROVED

ADDENDUM TO MANUAL 1-500783-157

MODEL ODM-1

## A. NOISE ON 1.5KHz RANGE WITH INTERNAL MODULATION

When the 10KHz or 100KHz frequency selectors are in the "V" position (required for internal modulation) there is sometimes a noticeable amount of noise present on the 1.5KHz range (approximately 1 division on the screen). This is caused by various signals used in the synthesis process and is normal for this mode of operation. Since this noise appears to "ride along" on the desired waveform, there is no loss of measurement accuracy of the desired signal deviation if the average value of this noise on the peaks of the desired waveform is considered.

## B. RECOMMENDED PROCEDURE FOR TRANSMITTER FM MEASUREMENTS WITH SMALL DEVIATIONS (1.5KHz RANGE)

In the setting of the 1KHz, 10KHz, and 100KHz frequncy selection controls for measurement of transmitter FM, it is recommended that the final setting of these controls not be in the "V" position in order to minimize noise on the recovered audio waveform.

**ADDENDUM**

**To Manual #1-500783-157 (Rev. B)**

**Oscilloscope Deviation Monitor**

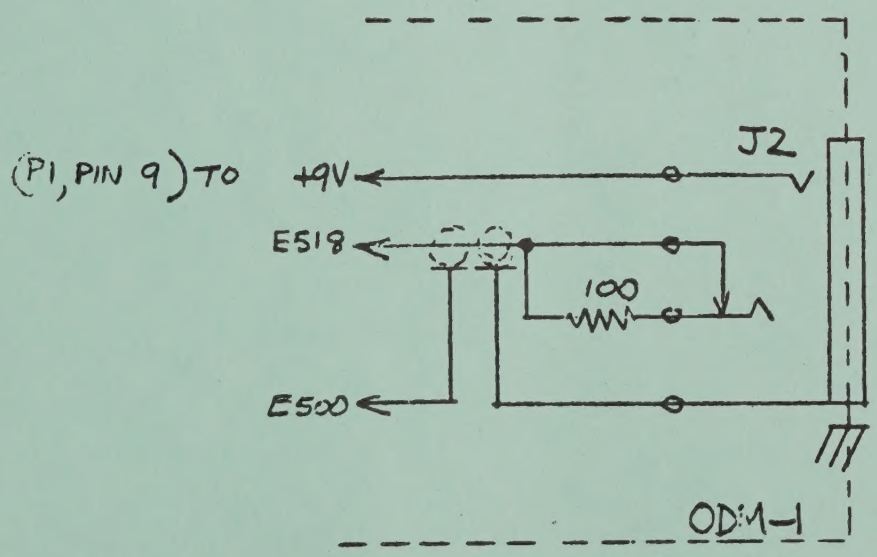
**Model ODM-1**

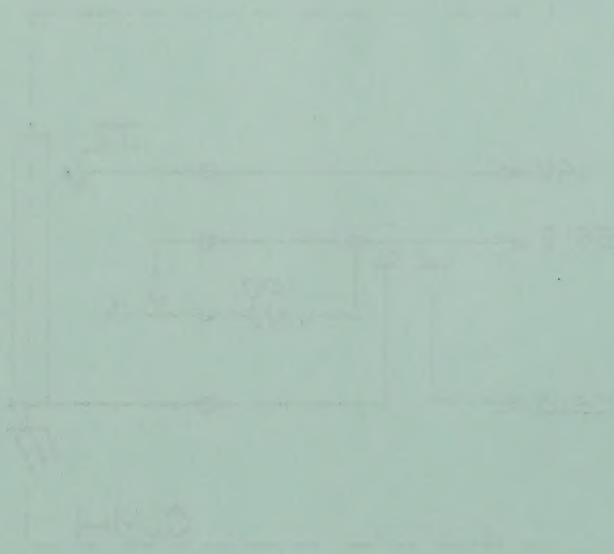
On ODM-1 units, Serial Number 377 and up, the SCOPE/ DIST ANAL output connector J2 is changed from a BNC type to a 3-conductor phone jack, per schematic below. The jack mates with a standard phone plug type PJ-068 (not supplied).

Part Numbers:

Resistor, Fixed, Comp, 100 Ω ± 5%, 1/4W
Singer P/N 1-945000-138

Plug, Phone, Type PJ-068
Singer P/N 1-910151-001 (not supplied)





MP MASTER
MA33074